News about

B.F.Goodrich Chemical *raw materials*

* reduced milling time

* Hycar meets aeronautical specs

One of the new applications *of Hycar American Rubber is this seal where Hycar is bonded to a steel washer. The rubber is thicker than the steel, thus when the seal is compressed the rubber provides leakproof sealing.*

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AMS 3211A . . . requiring good resistance to hot ethylene glycol-water mixtures, for packings and joint sealing compounds. A blend of Hycar 1042 and GR-S 1501 is entirely satisfactory.

AMS 3215F . . . requiring continuous or alternating exposure to both aromatic and non-aromatic fuels, for products such as gaskets, diaphragms, bushings, grommets, and sleeves. A Hycar 1042 compound meets the specification.

AMS 7260 . . . requiring good resistance to fuels, plus flexibility at temperatures down to 65° below zero. A Hycar 1043 compound meets the standards; applications include gland type packings and flexible couplings.

AMS 7270B . . . properties required include fuel resistance, flexibility at −65°F, aging in hot oil, cyclic fuel aging, and dry heat aging, for sealing ring application. A Hycar 1042 formulation is satisfactory.

AMS 7274C . . . requiring maintenance of properties under extreme variations in temperature and exposure to hot oils, for sealing ring application. A Hycar 1043 compound meets all minimum values.

AMS 3213F . . . requiring maximum resistance to aromatic and non-aromatic fuels when continuously or alternately exposed to both, for applications such as gaskets, bushings, grommets, and sleeves. A Hycar 1042 compound meets all values.

AMS 7271 . . . requiring service at temperatures to −65°F, with exposure to fuels, for sealing rings. Here a blend of Hycar 1042 and GR-S 1501 passes requirements.

For further information on Hycar nitrile rubber, write Dept. IO-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ont.

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Rubber Age

COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

Published Monthly by
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Editorial and Advertising Offices
101 West 31st St.,
New York 1, N. Y.
PEnnsylvania 6-6872

P. L. PALMERTON, *President*
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CONTENTS

VOL. 81, NO. 1 **APRIL, 1957**

How Voit Rubber Increased Productive Capacity Through Installation of a High Pressure Banbury-Extruder Combination—*By G. R. Gonyer* 75
An article relating the manner in which Voit Rubber increased its mixing capacity through the installation of a Banbury-extruder combination designed for complete automation.

Physical Testing in the Rubber and Plastics Industries 83
A continuation of the report of the symposium recently held by the Akron Rubber Group. This part includes the questions asked of the panel members and the answers given.

Division of Rubber Chemistry, A.C.S., Meets in Montreal on May 15 to 17 94
Abstracts of papers to be presented at the joint meeting of the Division of Rubber Chemistry, A.C.S., and the Rubber Division, C.I.C.

A Comparison of Instruments Used to Determine the Suitability of Elastomers for Low Temperature Service. I—Hardness—*By M. Hanok, C. K. Chatten and J. Z. Lichtman* 100
The first of several articles based on experimental work conducted at the Material Laboratory of the New York Naval Shipyard covering hardness, stress decay, brittleness, resilience, stiffness and compression set properties of elastomers at low temperatures.

A Non-Blooming High Temperature Resistant Vulcanizing Agent for Natural and Synthetic Rubbers—*By K. R. Cranker and V. H. Perrine* 113
Describing a new liquid vulcanizing agent developed for use with GR-S type, nitrile and natural rubbers, together with pertinent chemical and physical data.

Book Reviews	160	Markets	166
Canadian News	142	Names in the News	132
Capitol Cues	23	New Equipment	156
Chemical Prices	170	New Goods	152
Classified Ads	183	Obituaries	146
Coming Events	10	Overseas	148
Editorials	117	Statistics	*
Financial News	136	West Coast News	140
Letters to Editor	8	*Appears every other month	

Microfilm copies of complete volumes of RUBBER AGE are available from: University Microfilms, 313 North First St., Ann Arbor, Mich.
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Letters to the editor

Black Investigations

Dear Sir:

In an article in the October, 1956, issue of RUBBER AGE, by A. Fiorenza, entitled "Identification of Carbon Black by Means of Spectrophotometric Measurements," it was pointed out that the ratio of light transmissions of dilute aqueous dispersions of carbon blacks for two arbitrarily selected wavelengths in the visible range could be used as a characteristic property of the black.

More extensive investigations had been carried out in our laboratories, covering the ultraviolet, visible, and infrared ranges for carbon blacks dispersed in a white mineral oil. Some of our conclusions are the following:

1. The Lambert-Behr law is accurately followed in very dilute dispersions of carbon blacks in white mineral oil for the entire spectral range investigated (2,300-24,000Å).

2. All carbon black dispersions show similarities in their spectral curves, with straight or slightly curved lines down to 2,840Å and marked minima and peaks in the lower wavelength ultraviolet spectrum.

3. It is apparent that some of the characteristics of carbon blacks can be derived from the spectral curves.

A more extensive publication is being prepared.

ANDRIES VOET

J. M. Huber Corp.,
Borger, Texas

Re Suggested Society

Dear Sir:

I am in complete agreement with the opinions expressed by W. J. R. Hauser on the need for a practical manufacturing society for elastomer technologists. The present technical groups perform a valuable service, but they are primarily concerned with theory and research. Many of us, on the other hand, are more interested in problems having to do with manufacturing and to the use of various elastomers. I think it must be apparent to almost everyone that there is no present group from which one can get information on how to make a given product, or from which one can get production tips. As a matter of fact, I have never been able to locate textbooks which tell how to go about making given products. There should be something we all can do to get the ball rolling on this question.

T. L. BENNETT

North Bergen, N. J.

Memo from the Editor

The "Letters to the Editor" columns are open to all of our readers and we invite comments for publication. Address: Editor, RUBBER AGE, 101 West 31st St., New York 1, N. Y.

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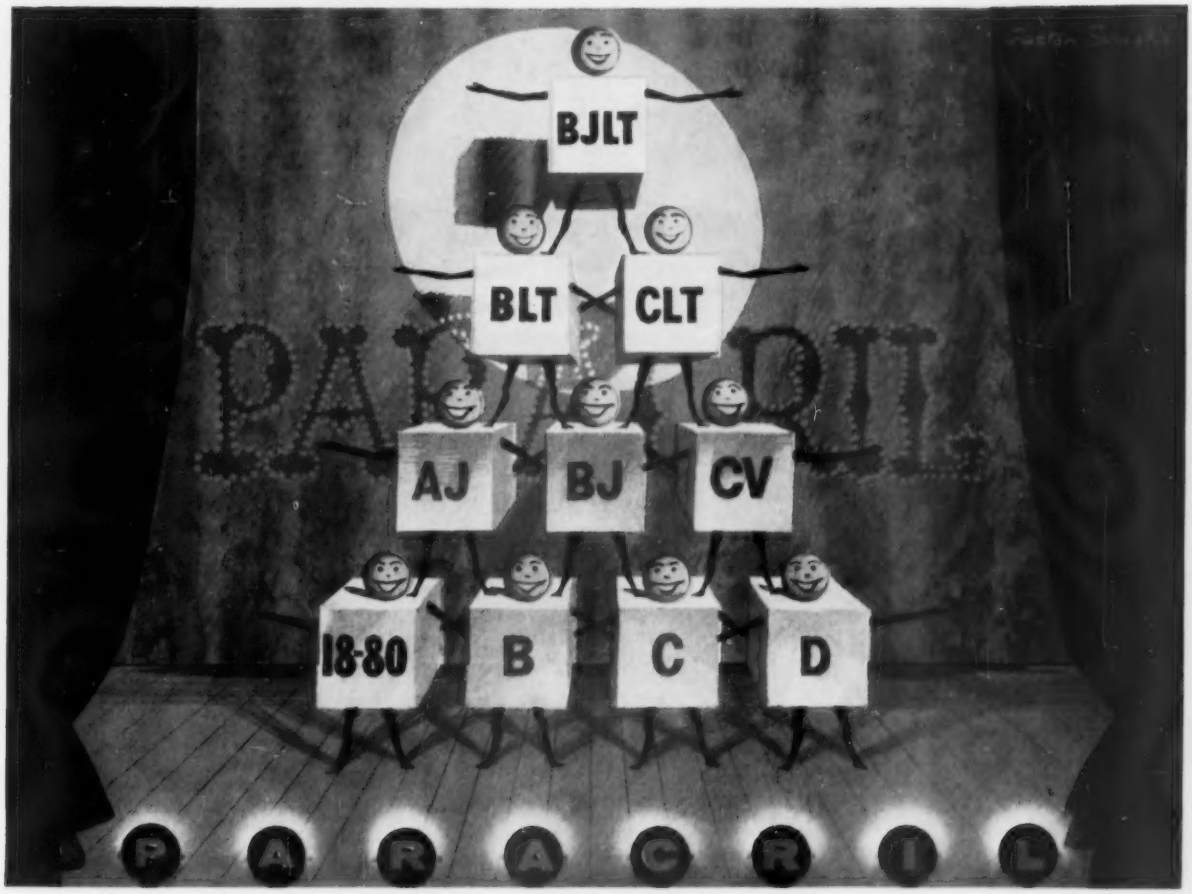

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Coming Events . . .

Apr. 26. Chicago Rubber Group, Furniture Mart, Chicago, Ill.

May 7. Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

May 10. Buffalo Rubber Group, Sheraton Brock Hotel, Niagara Falls, Ont., Canada.

May 10. Ontario Rubber Group, C.I.C., Niagara Falls, Ont.

May 15-17. Division of Rubber Chemistry, A.C.S., Joint Meeting with Rubber Chemistry Division of C.I.C., Sheraton-Mount Royal Hotel, Montreal, Que., Canada.

May 24. Connecticut Rubber Group.

June 1. Southern Ohio Rubber Group, Summer Outing, Inland Activities Center, Dayton, Ohio.

June 6. New York Rubber Group, Summer Outing, Doerr's Grove, Milburn, N. J.

June 7. Fort Wayne Rubber & Plastics Group, Summer Outing, Lake Tippecanoe, Leesburg, Ind.

June 7. Quebec Rubber & Plastics Group, Golf Tournament.

June 7-8. Southern Rubber Group, Dinkler Plaza Hotel, Atlanta, Ga.

June 7-9. Los Angeles Rubber Group, Summer Outing, Sahara Hotel, Las Vegas, Nevada.

June 9-13. A.S.M.E. Semi-Annual Meeting, Sheraton-Palace, San Francisco, Calif.

June 11. Buffalo Rubber Group, Summer Outing.

June 14. Boston Rubber Group, Summer Outing, Andover Country Club, Andover, Mass.

June 16-21. A.S.T.M., Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

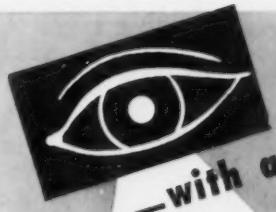
June 21. Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

June 28. Detroit Rubber & Plastics Group, Western Country Club, Detroit, Mich.

July 26. Chicago Rubber Group, Golf Outing, Medinah Country Club, Chicago, Ill.

Aug. 1. New York Rubber Group, Golf Outing, Baltusrol Golf Club, Springfield, N. J.

Aug. 16. Philadelphia Rubber Group, Golf Outing, Manufacturers' Country Club, Philadelphia, Penna.



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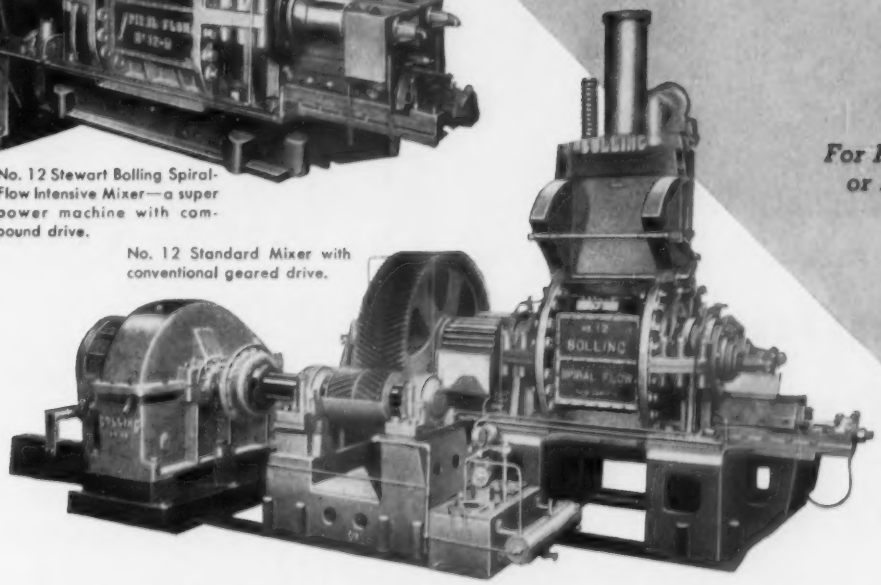

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Coming Events (cont'd) . . .

Sept. 7. Connecticut Rubber Group.

Sept. 11-13. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Commodore, New York, N. Y.

Sept. 23-25. A.S.M.E., Fall Meeting, Hotel Statler, Hartford, Conn.

Sept. 26. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Oct. 1. Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

Oct. 4. Detroit Rubber & Plastics Group, Detroit-Leland Hotel, Detroit, Mich.

Oct. 4. New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

Oct. 8. Buffalo Rubber Group, Hotel Westbrook, Buffalo, N. Y.

Oct, 18. Boston Rubber Group, Fall Meeting, Somerset Hotel, Boston, Mass.

Oct. 24. Southern Ohio Rubber Group, Fall Technical Meeting, Engineers Club, Dayton, Ohio.

Oct. 25. Akron Rubber Group, Fall Meeting, Sheraton-Mayflower Hotel, Akron, Ohio.

Oct. 25. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Nov. 5. Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

Nov. 15. Connecticut Rubber Group.

Nov. 15-16. Southern Rubber Group, Memphis, Tenn.

Dec. 1-6. A.S.M.E. Annual Meeting, Hotel Statler, New York, N. Y.

Dec. 3. Buffalo Rubber Group, Xmas Party.

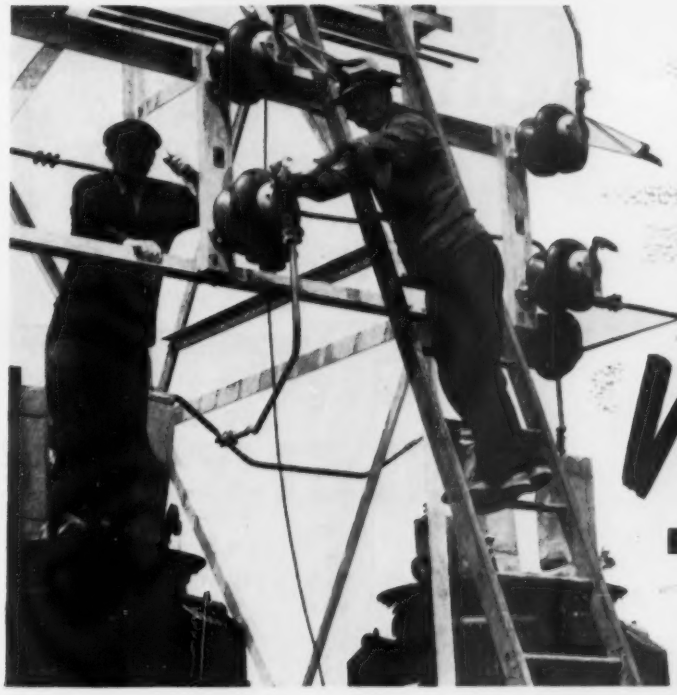
Dec. 5. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Dec. 6. Detroit Rubber & Plastics Group, Xmas Party, Sheraton-Cadillac Hotel, Detroit, Mich.

Dec. 13. Boston Rubber Group, Xmas Party, Somerset Hotel, Boston, Mass.

Dec. 13. New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

May 14-16, 1958. Division of Rubber Chemistry, A.C.S., Spring Meeting, Netherlands Plaza Hotel, Cincinnati, Ohio.



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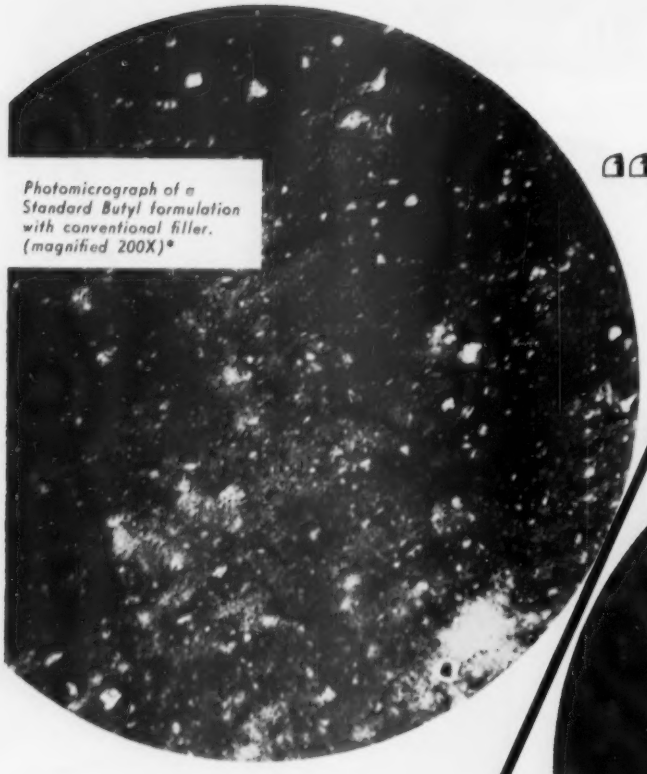
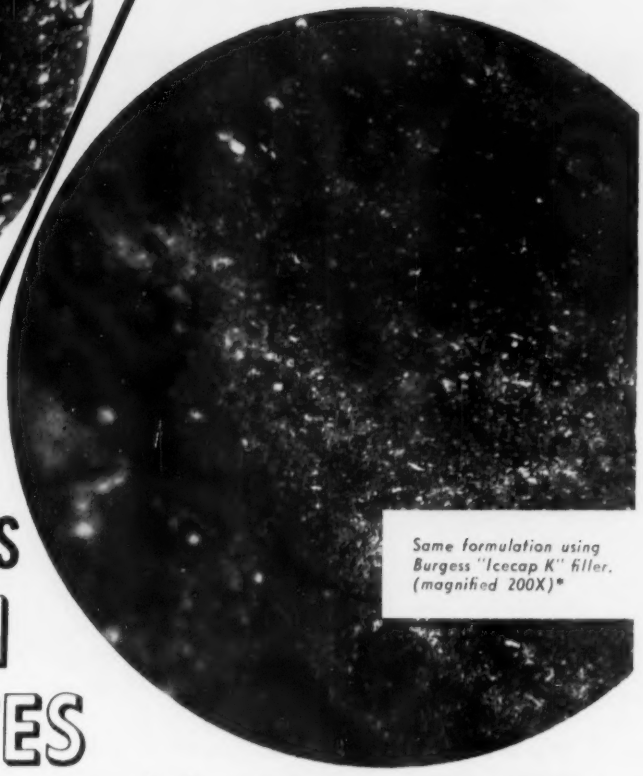


Photomicrograph of a Standard Butyl formulation with conventional filler. (magnified 200X)*

Burgess "ICECAP K" for



Same formulation using Burgess "Icecap K" filler. (magnified 200X)*

SUPERIOR BUTYL RUBBER COMPOUNDS FREE FROM AGGLOMERATES

Burgess offers a more uniform calcined kaolin pigment —free from agglomerates! Especially useful in Butyl Wire & Cable Insulating Compounds, "Icecap K" offers excellent processing, reinforcing, and electrical properties.

Technical data, working samples and prices, upon request.

features:

- Nil screen residue with 325 mesh screen
- Better dispersion
- Freedom from agglomerates
- Increased tensile strength
- Good electrical properties
- Low moisture absorption
- Superior curing and processing properties
- Top reinforcing qualities
- Excellent alkali and acid resistance

***Torn section of a 1/16" slab**

Burgess Pigment COMPANY

Mines and Plants: Sandersville, Georgia

EXECUTIVE SALES OFFICES: P. O. BOX 145, SANDERSVILLE, GA.
West Coast: L. H. Butcher Co., San Francisco & Los Angeles, Cal.
Warehouses: Jersey City & Trenton, N. J.; Saylesville, R. I.

- **HYDROUS AND ANHYDROUS ALUMINUM SILICATE PIGMENTS**
- **KAOLIN CLAYS**

. . . and here's a good tip for you . . . ASRC has a reputation for efficient service, too!

ASRC offers you highest quality synthetic rubber . . . efficient service that is timed to your needs . . . personal attention to your orders . . . prompt shipments. You will find it pays to rely on ASRC for *quality* products and *quality* service.

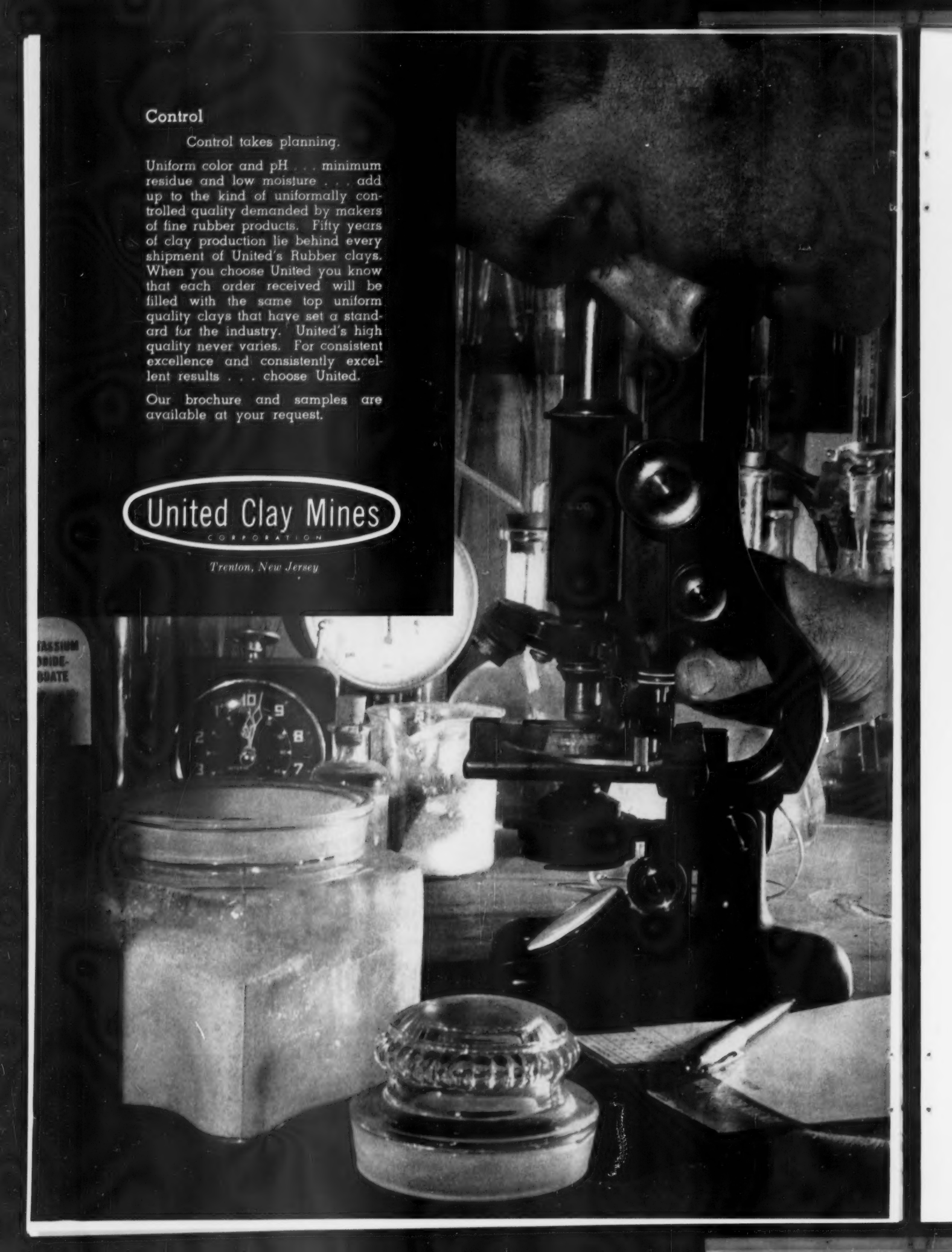
CURRENT POLYMERS

COLD	CLASS	HOT	CLASS
ASRC 1500	Staining	ASRC 1000	Staining
ASRC 1502	Non-Staining	ASRC 1001	Slightly Staining
ASRC 1503	Non-Staining	ASRC 1004	Staining
ASRC 3110	Non-Staining	ASRC 1006	Non-Staining
COLD OIL		ASRC 1009	Non-Staining
ASRC 1703	Non-Staining	ASRC 1018	Non-Staining
ASRC 1708	Non-Staining	ASRC 1019	Non-Staining

ASRC

AMERICAN SYNTHETIC RUBBER CORP.

Executive and Sales Offices: 500 5th Ave., New York 36, N. Y.
Midwest Sales Office: 22 Riverbend Pkwy., Fremont, Ohio • Plant and General Offices: Louisville, Ky.
Cable: AMSYNRUB NEWYORK


Control
Control takes planning.
Uniform color and pH . . . minimum residue and low moisture . . . add up to the kind of uniformally controlled quality demanded by makers of fine rubber products. Fifty years of clay production lie behind every shipment of United's Rubber clays. When you choose United you know that each order received will be filled with the same top uniform quality clays that have set a standard for the industry. United's high quality never varies. For consistent excellence and consistently excellent results . . . choose United.
Our brochure and samples are available at your request.
United Clay Mines
CORPORATION
Trenton, New Jersey

Footwear manufactured by the Tyer Rubber Company, Inc., Andover, Massachusetts

It frees the foot–and the fancy

To keep a step ahead of the competition and to satisfy the increasingly discriminating consumer are constant problems to today's manufacturer. Regardless of product, he must ever search for improvement–in new materials and manufacturing techniques.

A long stride forward was recently taken by a leading maker of canvas shoes, when he started using PLIOFLEX rubber in his top lines. For with PLIOFLEX, he literally made his customers more foot-loose and fancy-free.

The first advantage of using PLIOFLEX was to permit combining techniques (methods of adhering the rubber to the canvas) to insure breathability and full washability. It also assured full flexibility and a light-colored sole for comfortable, unrestrained use–and without danger of marking any surface.

To capture the customer's fancy, PLIOFLEX also permitted the use of a range of clear, bright, light colors. Further eye appeal was added by its ability to hold embossed designs on the foxing, outsoles and other trims. And if all this wasn't enough, PLIOFLEX also lowered costs.

If your product uses rubber in any form, be sure you have the full story on PLIOFLEX. It's easy to obtain, just write to: Goodyear, Chemical Division, Dept. D-9419, Akron 16, Ohio.

CHEMICAL
GOODYEAR
DIVISION

RUBBER & RUBBER CHEMICALS DEPARTMENT

Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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QUALITY ENGINEERING
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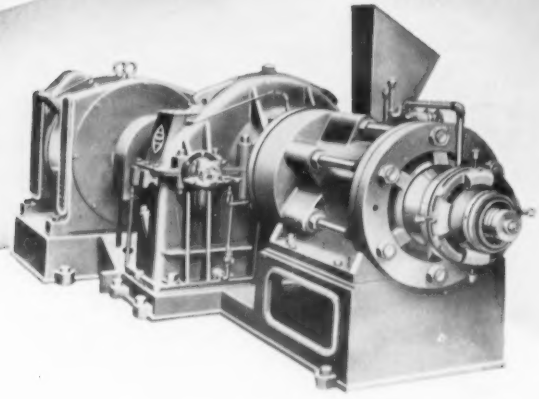

Variable speed drives, carefully designed flow channels. Heat extraction and accurate temperature control are precision features of Shaw design which promote quality products at high production rates. Piping, tubing, miscellaneous sections and sheathing and insulating of cables are adequately catered for by the wide selection of die-heads available. Francis Shaw & Co. Ltd. supply a unique range of plant for the Rubber and Plastic Industries. Enquiries are invited for layout suggestions and arrangements most suitable for your particular requirements.

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TELEPHONE EAST 1415-8 TELEGRAMS CALENDER MANCHESTER TELEX 66-357

P1477

← As white as the day it was molded, 25,000 miles ago!

Glidden ZOPAQUE Titanium Dioxide pigments play a leading role in this miracle of modern rubber chemistry! In spite of continuous all-weather service, this Goodyear white sidewall tire has never lost any of its original extreme whiteness!

Glidden ZOPAQUE Titanium Dioxide imparts exceptional hiding power, outstanding gloss and color retention, low reactivity in formulations for rubber, plastic, paint, paper and ceramics. Available in Rutile and Anatase grades. Write today for detailed information.

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CHEMICALS PIGMENTS METALS

QUALITY Glidden PRODUCTS

LATEX FOAM?

In the West—make it from SHELL SYNTHETIC RUBBER

If you make or contemplate making foam rubber products, you will be glad to know that a new unit to produce cold high solids butadiene-styrene latices has just come on stream at Torrance.

Shell Chemical's newest Latex S-2105 has excellent uniformity, color and aging properties. It is ideal for latex foam, carpet backing adhesives and other applications where a high-solids latex is required.

In addition to latices, a full line of butadiene-styrene solid type rubber is available to fulfill the requirements of Western manufacturers, large and small.

Convenient location and diversity of product make Torrance your logical Western source for synthetic rubber. Important, too—Shell's Technical Service Laboratory is ready to help you find practical solutions for troublesome technical problems.

Think of Torrance, California, whenever you need synthetic rubber in solid types or liquid latices. Our phone number in Los Angeles is Faculty 1-2340.

SHELL CHEMICAL CORPORATION

Synthetic Rubber Sales Division
P. O. Box 216, Torrance, California

SHELL

Capitol Cues

THE BUSINESS OUTLOOK FOR THE REST OF 1957 is still good, say experts in industry and government. Businessmen are advised to keep this in mind as they read about stock market weakness, order cutbacks, profits squeezes, etc. There are some soft spots—no denying it. But they don't foreshadow anything like a recession. Indeed, businessmen are warned not to rush and cancel plans, lest they find themselves losing sales later on.

This moderately optimistic forecast has been reported before, but it's worth repeating in view of the pessimism going around. The point is this: Unsung strengths in the picture offset the publicized weaknesses. Government and consumer spending is still on the rise—even if home-building is dipping further and output is suffering in some lines because of high inventories.

The latter part of this year is just as likely to see a smart upturn in business as a leveling out. It could happen, despite the doubts on Wall Street. You may recall there was uncertainty at this time in 1956—but the year ended up on a solid note. By the end of this year, the hard-hit lines will have worked off excess inventories and put production into balance with demand.

NEW INDICATIONS AS TO THE TREND of business later on should be in hand in a month or so. We'll know more about industry's plans to invest in new plant—a big determinant of business activity. And we should know about the consumer's mood from his Spring spending for autos and Easter apparel.

CORPORATIONS WILL MAKE HIGH PROFITS again this year, say government analysts. The total may not quite measure up to last year's $43.4 billion. However, it will surprise many who fear rising costs will cut deep into net.

There WILL be squeezes in some lines. Costs are increasing, and growing competition will make it harder to raise prices. But sales will be up, too—and that will make the difference. The greater volume will keep cost hikes from cutting too deep.

Of course, not every line will gain over last year. Declines are likely to occur in railroads, textiles, furniture, and the nonferrous metals. On the other hand, though, gains are probable for the utilities, autos, steel, oil, and machinery.

NO BIG SLUMP IN THE STOCK MARKET is expected by these same analysts. (They study it because they know its impact on psychology and confidence.) True, there's no reason to look for rises for awhile, with profits leveling off. Indeed, further small declines in share prices may yet be in the wind.

The market now has a brake that rules out a real slump. The big institutional investors—mutual funds, etc.—now own large stock blocks. They buy for the long pull and don't scare easy.

Furthermore, there's very little credit in the market, compared with 1929, so margins can't be wiped out easily by declines. Finally, folks these days hold stocks for long-term growth. Back 25 years, prices would fall 50% in a year. Now? 10-20%.

Continued on Next Page

A DRIVE TO TRIM EISENHOWER'S BUDGET for the coming fiscal year has been launched by a bi-partisan group of Congressmen. They have two objects: (1) to halt the trend to higher spending, and (2) to make room for tax cuts. (It would take a $4 billion surplus to give modest relief for individuals.)

> In its present mood, Congress may pare a little—probably under $1 billion. Much of the spending down for next year was voted —and committed—in previous years. There are few new programs that can still be nipped in the bud. Adding $1 billion to the $1.8 billion surplus now forecast still wouldn't allow a cut.

WHEN CAN YOUR TAXES BE REDUCED—if this year is out of the question? Talks with key Treasury officials and leaders in Congress give this answer: Not till 1959, at the earliest—as far as individual taxpayers are concerned. Corporations will have to wait until 1960, or perhaps longer than that.

> Spending will keep rising in coming years, despite the efforts to cut. More complex and expensive weapons will boost defense costs, while practically all nondefense programs are expanding. All told, spending will be going up $1 to $2 billion a year.
>
> Revenues will be up, too—slightly faster than spending—as the economy grows and boosts taxable incomes and profits. The volume of Treasury receipts could well climb $3 billion a year. So it will be two years till the surplus is big enough for cuts.

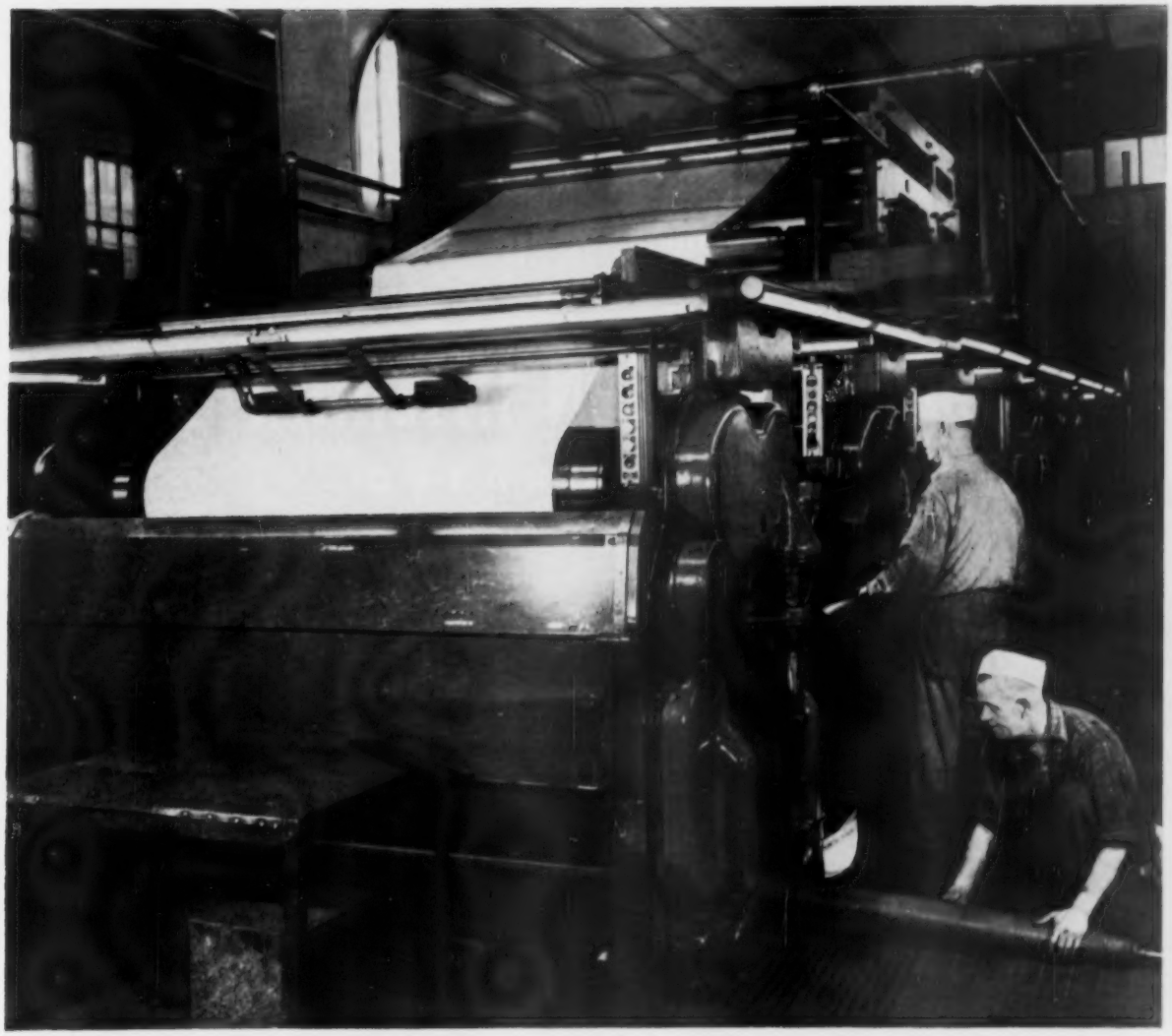
TREASURY WILL AUDIT MORE TAX RETURNS this year than ever before, because it has expanded its agent-force and can check on many more returns. Of course, all returns are always examined for simple errors in arithmetic. Then, some returns are put aside for special treatment—a thorough audit.

> The Treasury picks returns for full audit at random. Taxpayers WITH business income get it in 10% of all cases on the average. The figure is 50% when income is $10,000 to $30,000, and 100% for incomes over $50,000. Returns without business income are fully audited in 3% of cases. But where net is between $10,000 and $50,000, the number is 15%; ALL over $50,000 are audited.

NEW STATE HIGHWAY LAWS WILL BE VOTED this year by the 45 legislatures scheduled to meet. They will increase costs of vehicle operation for both individuals and business firms. Gasoline taxes will be raised 1¢ or 2¢ a gallon in many; inspection systems will be established in others; and there will be new or increased taxes on auto, truck, bus, and operators' licenses.

WHAT SHOULD ONE DO WITH OLD E OR H BONDS, now that the Treasury will be issuing new ones at higher interest rates? (Congress is certain to give officials the power very soon to hike the return from 3% to 3¼%.) Going over the fine print of the proposed changes, here is what bond experts advise:

> Whether or not present owners should cash in E or H bonds—and buy the new ones—depends on how long the bonds have been held. The fact is that any E or H bond owned for more than two and a half years will give a BETTER yield to maturity than a new one. And if you cash in now, you must pay tax on accumulated interest.



Best answer to a demanding roll call

One of the most demanding uses for rubber-covered rolls is in big newspaper presses. Powerful ink and cleaning solvents, lubricating oils and greases, heat, impact and abrasion—all can soon take the measure of ordinary rubber.

In answer to the call for longer-lived press rolls is CHEMIGUM nitrile rubber. CHEMIGUM is readily compounded and processed into fast curing, long wearing, heat-, oil- and solvent-resistant rolls that make an excellent impression on printers everywhere.

Why not answer the next call you get for press rolls—or any type of oil-resistant roll—with unusually light-colored CHEMIGUM? Meanwhile, write for details, samples and the latest *Tech Book Bulletins*. Address: Goodyear, Chemical Division, Akron 16, Ohio.

CHEMICAL
GOODYEAR
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RUBBER CHEMICALS
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High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Binney & Smith International, Inc.

announces

its new name as of April 1, 1957

will be

COLUMBIAN CARBON INTERNATIONAL

INCORPORATED

The same experienced staff will continue to serve foreign industries with the same fine products of the Columbian Carbon Company. Only the name is changed.

COLUMBIAN CARBON INTERNATIONAL, INC.

is also exclusive representative for manufacturers of:

Fillers Hisil, Silene Calcene, Clays	**Pigments** Dry and Dispersed White and Colored	**Sulfur**	**Latex**
Antioxidants	**Plasticizers**	**Resins**	**Reclaimed Rubber**
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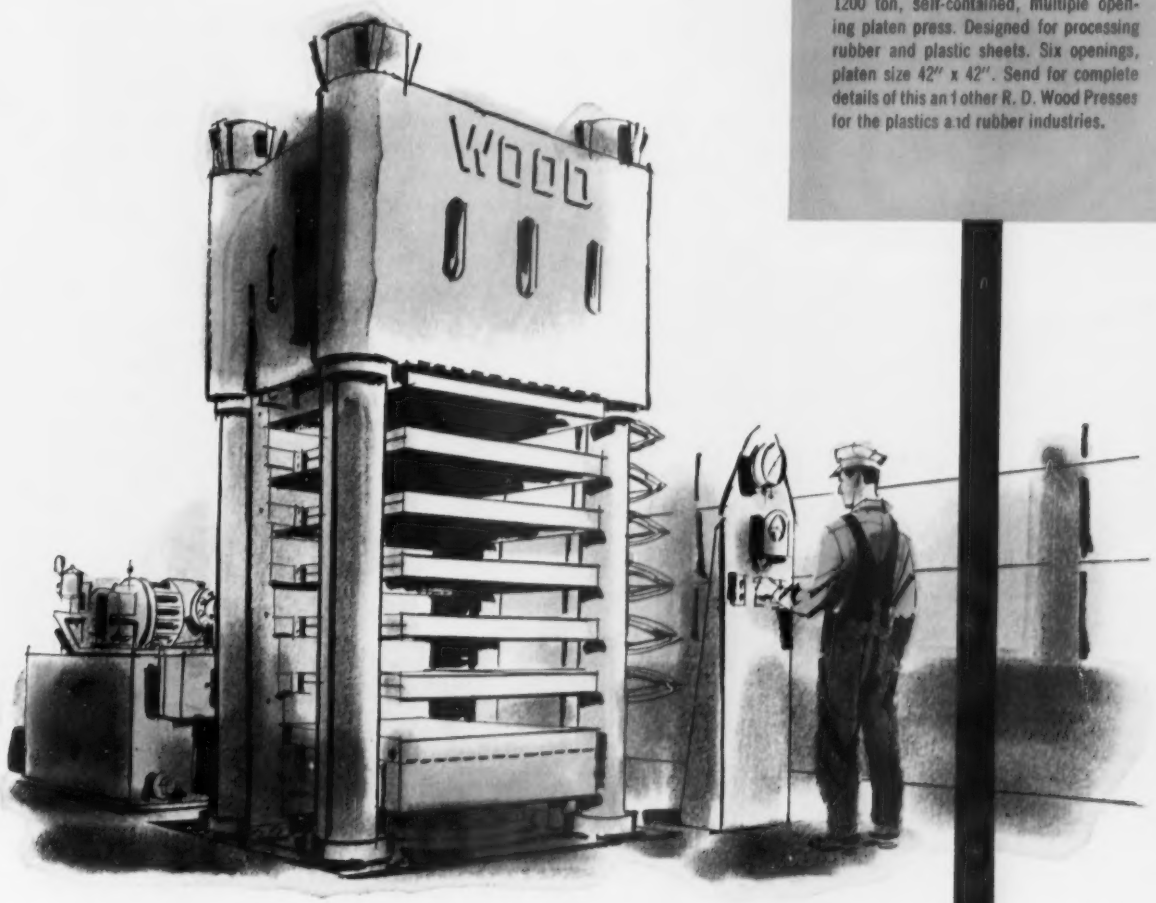
There's always a job for a Wood Press . . . and a Wood Press to do the job

When you want a production shortcut—or downtime and costs need cutting—there's a job for a Wood Press. And in almost every type of plastics or rubber operation, there's a Wood Press to do the job. R. D. Wood builds presses for such jobs as molding, curing, laminating, polishing and processing—besides designing and constructing others for special work. All have three things in common: sound design, carefully selected materials, conscientious workmanship. As a result, R. D. Wood Presses consistently deliver the utmost in smooth, dependable performance; fast, economical production; trouble-free operation. Write for catalog and engineering information—without obligation.

1200 ton, self-contained, multiple opening platen press. Designed for processing rubber and plastic sheets. Six openings, platen size 42" x 42". Send for complete details of this and other R. D. Wood Presses for the plastics and rubber industries.



R. D. WOOD COMPANY

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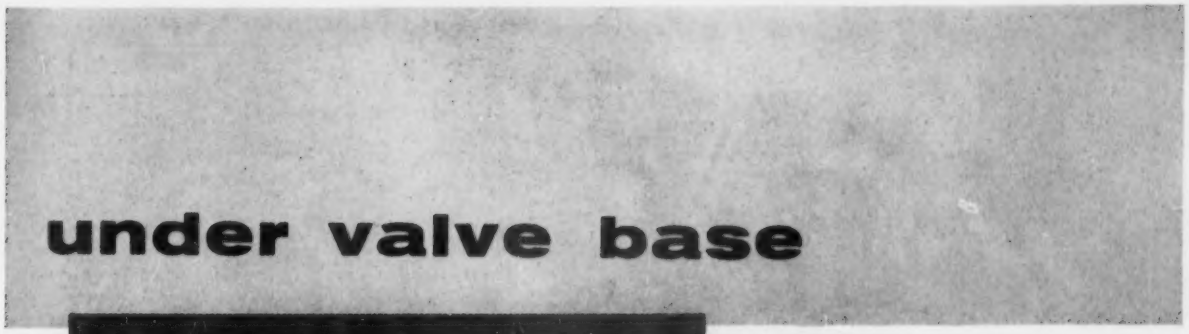
PROBLEM . . .
"sponginess"



SOLUTION . . .

KURE-BLEND MT

This very problem faced a leading tire tube producer six months ago. The problem was completely solved by adding Kure-Blend MT during stock processing. Several others have proved the same benefits since. This curing problem could have been solved by increasing cure time ½—1 minute, but Kure-Blend solved it without any increase in time.

Kure-Blend®, a 50 GRS-50 TMTD latex-compounded masterbatch, provides faster, more even dispersion, thus allowing full advantage to be gained from TMTD used for acceleration.

Kure-Blend offers these additional advantages:

- **Faster, easier incorporation**
- **Can be more accurately weighed**
- **Indefinitely storage-stable**
- **No dusting**
- **Assures uniform cure**
- **No premium cost**

There's no need to increase cure time—just add Kure-Blend MT to be sure of tube cure!

For literature and samples, write to:

THE GENERAL TIRE & RUBBER COMPANY

Chemical Division

AKRON, OHIO

Creating Progress Through Chemistry

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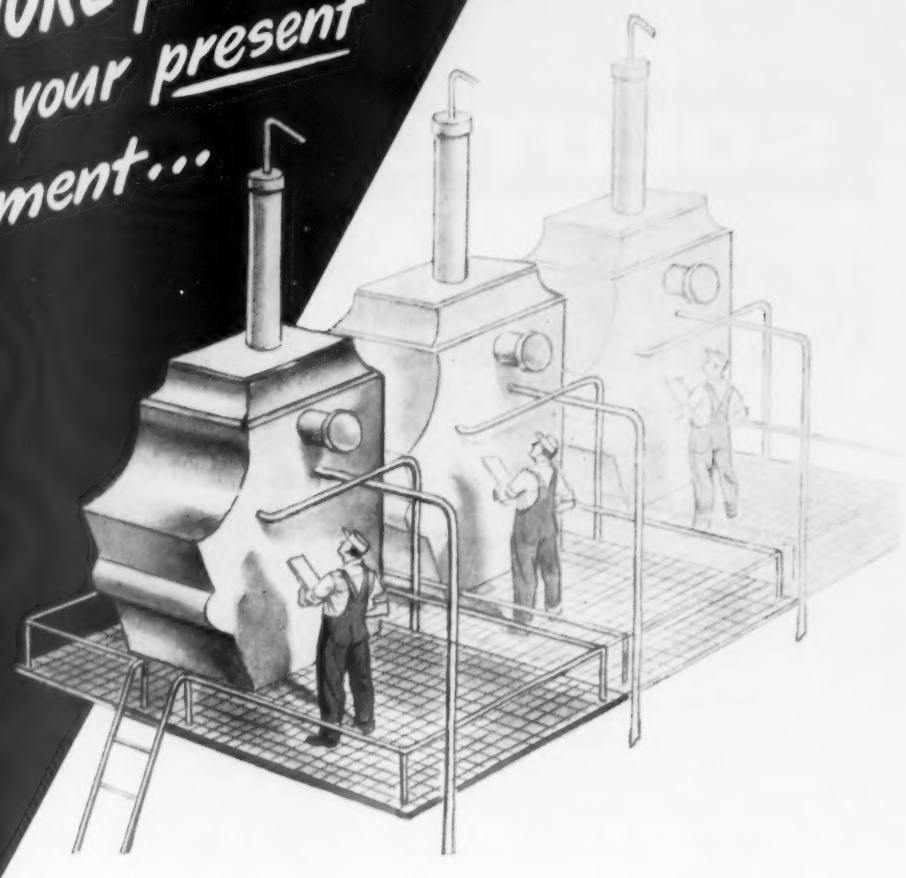
KURE-BLEND®

Get MORE production from your present equipment...



by using RECLAIMATOR RECLAIMS

Buffalo RECLAIMATOR RECLAIMS give:

- more usable mixer space, permitting an average 10% increase in batch size.
- faster mixing with an average 15% reduction in cycle time.
- lower horsepower requirement.
- cooler mixing with resultant good dispersion and less scorched compound.
- good dispersion when added to a final mix.

Write for Bulletin No. RR-1

Explains our exclusive, patented Reclaimator Reclaim process.

74 Years Serving the Industry Solely as Reclaimers

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P.O. BOX 365 BUFFALO 5, N.Y.

HOW THE SILICONES MAN HELPED...

Build a Gyro for Straight Shooting!

Accuracy that could hit a fly from a screaming roller coaster . . . so rugged that it can be used to drive nails without impairing its operation. That's the "impossible" fire control gyro built by Minneapolis Honeywell, Aeronautical Division. Known as the HIG-5 (Hermetic Integrating Gyro), lightweight and small enough to hold in the palm of your hand, it supplies the "sense of balance" necessary at supersonic speeds.

Operating in a viscous fluid under wide limits of temperature and pressure, seals can be no less than perfect. What material was used? "O" rings of UNION CARBIDE Silicone Rubber.

Fabricated by Moxness Products Company, Racine, Wisconsin, these "O" rings were tested from —65 to +200 deg. F., at simulated pressures from ground level to operational altitudes. Under such rigid tests, UNION CARBIDE Silicone Rubber showed outstanding sealing qualities and resistance to compression set.

This is another example of how the UNION CARBIDE Silicones Man has helped solve an "impossible" problem. A booklet—"Look to UNION CARBIDE for Silicones"—describes silicone rubber and many other silicone products. Write Dept. RA-4 today. Silicones Division, Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y.

UNION CARBIDE
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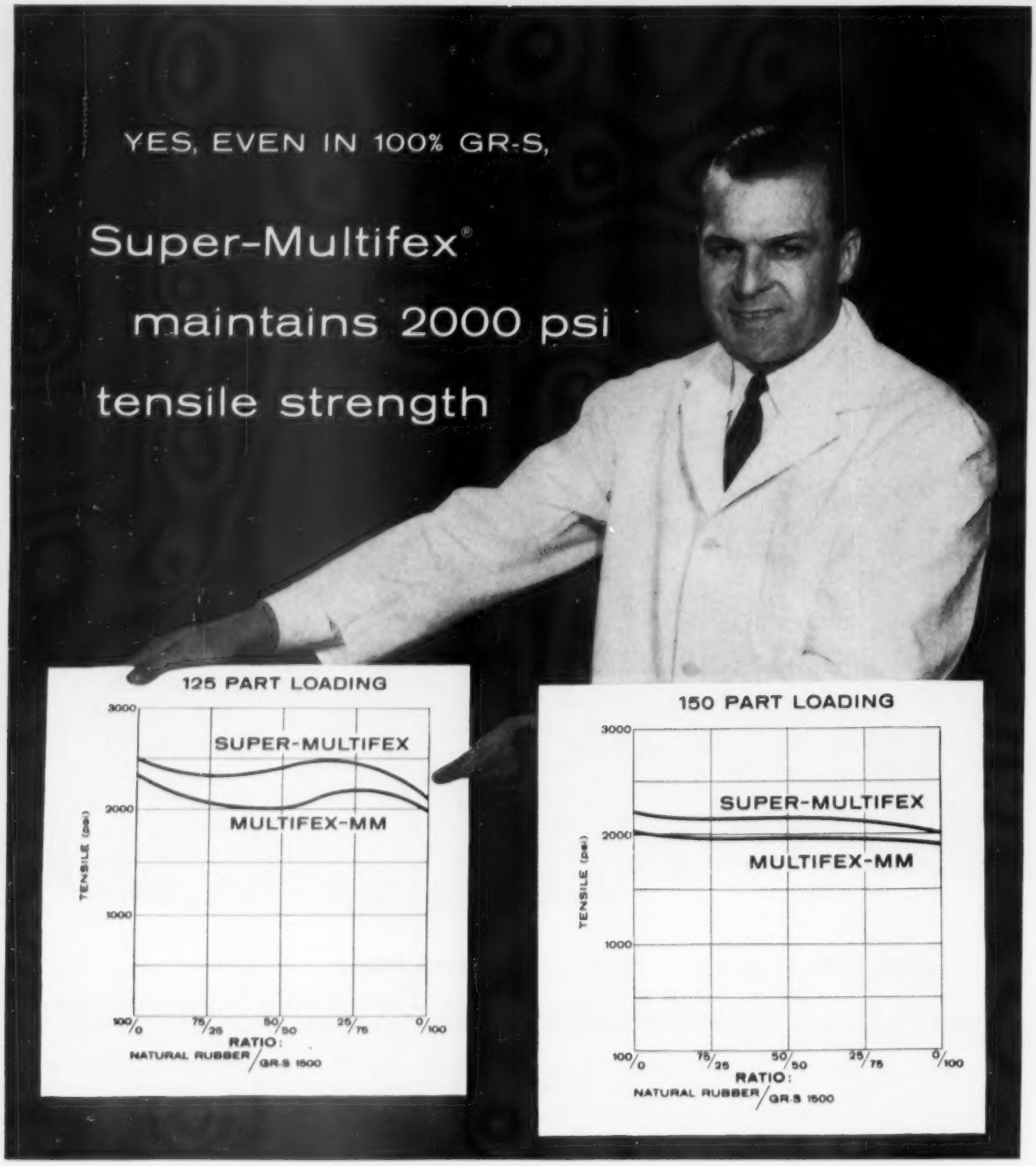
SILICONES

The term "Union Carbide" is a registered trade-mark of U.C.C.

In Canada: Linde Air Products Company, Division of Union Carbide Canada Limited, Toronto.



Now you can use DIAMOND Super-Multifex in your GR-S compounds—even in those with *no* natural rubber—and be sure you're getting at least 2000 psi tensile strength.

Contrast the performance of Super-Multifex and Multifex-MM® with the much lower tensiles normally obtained in compounds containing ground limestone.

DIAMOND's ultra-fine Super-Multifex (.03 micron) precipitated calcium carbonate has extremely uniform particles, coated to aid dispersion, mixing and processing.

Multifex-MM, also shown on the graphs, is an uncoated, ultra-fine (.04-.06 micron) precipitated calcium carbonate. You can see how it consistently reinforces GR-S, too.

Try either Super-Multifex or Multifex-MM in your next batch to improve physical properties. Call your DIAMOND Representative today. He can supply information and technical help on these and other high-grade calcium carbonates. Or write DIAMOND ALKALI COMPANY, 300 Union Commerce Bldg., Cleveland 14, Ohio.

DIAMOND CHEMICALS

Philchem

RUBBER CHEMICALS
NEWS ITEM NO. 6

Use PHILBLACK* E and PHILPRENE* 1500 in Butyl Bladders

Laboratory investigations show that optimum performance of Bag-O-Matic bladders is obtained with Philblack E reinforcement. With 50 parts Philblack E, incorporation of 10 parts of Philprene 1500 imparts excellent stability to the vulcanizate during exposure in open steam. Essentially equal performance can be obtained with 60 parts Philblack E in the absence of other additive rubbers to help retard reversion. Typical test data for these stocks are cited in the table at right.

Complete Technical Service

For individual advice on processing and recipes, call your Phillips technical representative. He is technically qualified to help you smooth out processing and operational difficulties. And in addition, he can give you the benefit of Phillips extensive research and years of practical experience in solving rubber problems.

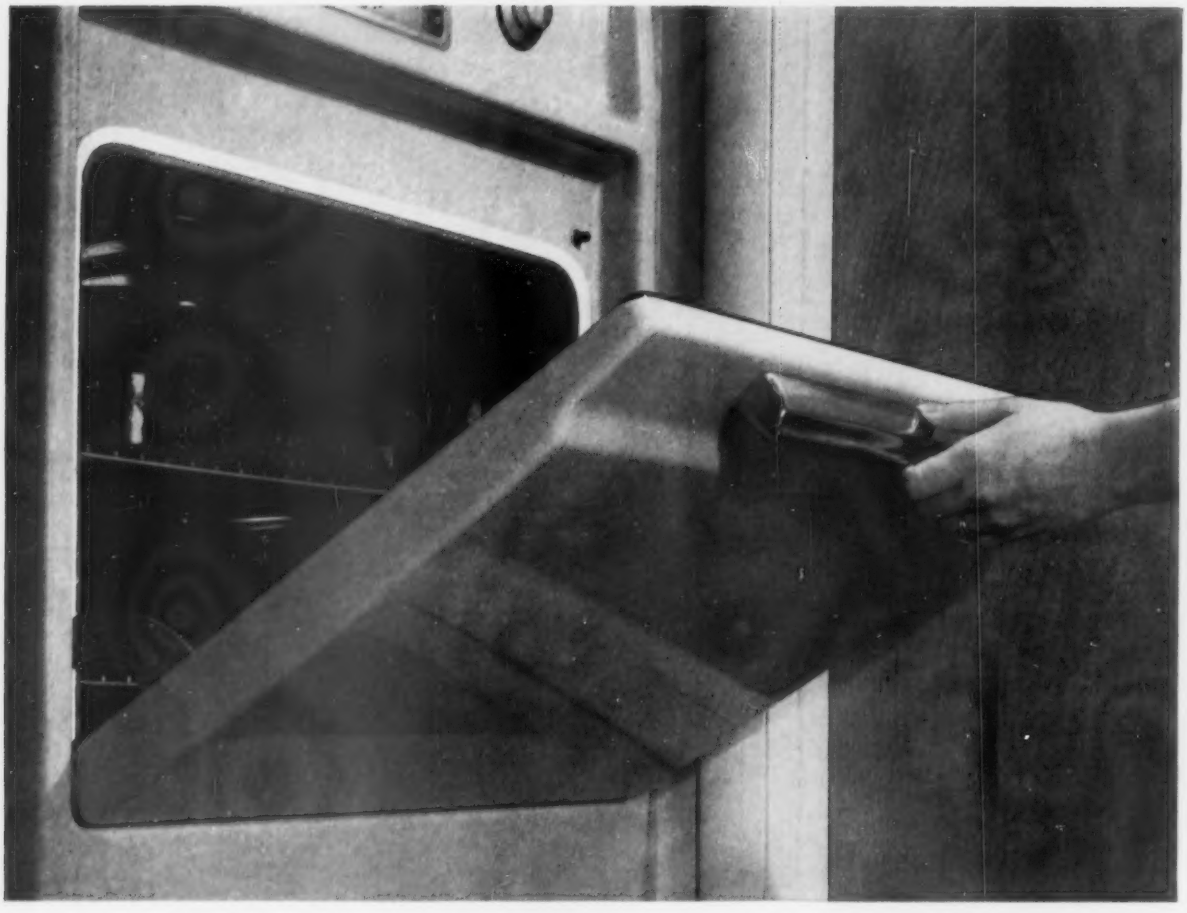
COMPOUNDING RECIPES	A	B	C
Butyl 215	100	100	100
Philprene 1500	—	10	—
Neoprene GNA	10	—	—
Philblack E	50	50	60
Forum 40	6	6	6
Zinc Oxide	5	5	5
Petrolatum	2	2	2
GMF	2	2	2
Red Lead	8	8	8
Sulfur	2	2	2
SUMMARY OF PHYSICAL PROPERTIES			
Mooney, ML-4-212°F	85	88	107
Ultimate Tensile, psi	2,180	2,340	2,450
Ultimate Elongation, %	465	365	350
Shore A Hardness	66	69	69
ASTM Compression Set, %	21.5	19.1	19.5
AGED 96 HOURS IN OPEN STEAM AT 328°F			
Ultimate Tensile, psi	1,000	1,575	1,610
Ultimate Elongation, %	300	340	310
3" x 3" x ½" blocks aged 600 hours in open steam at 328°F			
Resistance to Surface Oxidation of Block	Fair	V. good	V. good
Durometer Change of Block	+3	+6	+1

Steam pressure released daily and samples examined. None of the samples developed ply separations or blows. Surface oxidation was evaluated by ease with which surface could be scratched with knife.

PHILLIPS CHEMICAL COMPANY
Rubber Chemicals Division
318 Water Street, Akron 8, Ohio

District Offices: Chicago, Providence and Trenton

*A trademark



SILASTIC 432 Base

Speeds Compounding of High Strength Stocks

TYPICAL PROPERTIES OF
OVEN DOOR GASKETS
MADE WITH SILASTIC 432 BASE

Temperature range, °F	−100 to +500
Tensile strength, psi	720
Elongation, %	260
Tear strength, ppi	70
Compression set, %	40
Hardness, durometer	50

All properties obtained on ASTM slabs molded 5 minutes at 260°F and cured 8 hours at 480°F.

When it comes to quick, easy compounding of silicone rubber stocks with superior *physical properties*, there is no other gum available like Silastic* 432 Base. What's more, this unique Dow Corning gum has remarkable shelf stability . . . low moisture absorption . . . low compression set—without toxic additives . . . and can be compounded to withstand temperatures from −100 to 500 F and intermittent exposures up to 600 F. Stocks made with Silastic 432 Base assure highest performance standards for molded, extruded, or calendered parts.

Do you want the recipe and complete compounding instructions for this oven door gasket compound using Silastic 432 Base? It's yours for the asking . . . just contact the nearest Dow Corning branch office for prompt service.

***FREE SAMPLE** . . . Try Silastic 432 Base in your own plant. Write today.*

Address Dept. 9216.

DOW CORNING SILICONES

DOW CORNING CORPORATION
Midland, Michigan

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS DETROIT LOS ANGELES NEW YORK WASHINGTON, D.C. (SILVER SPRING, MD.)
CANADA: DOW CORNING SILICONES LTD., TORONTO GREAT BRITAIN: MIDLAND SILICONES LTD., LONDON FRANCE: 37 QUAI D'ORSAY, PARIS

*T.M. REG. U. S. PAT. OFF.

GOOD REASONS

it pays to call the F-B® expert for regular Banbury® inspections

HE WILL MAKE A THOROUGH CHECK-UP —

at no cost to you, of all gears, bearings, rotors, mixing chamber, etc. He has the knowledge and experience to tell you what (if anything) is wrong and how it can be cured quickly, surely, correctly. Suggestion: Have your other F-B equipment examined at the same time.

HE WILL HELP YOU MAINTAIN EFFICIENCY —

and help reduce downtime. Backed by the original manufacturer's facilities, he is in a position to recommend recently improved parts and materials — give you up-to-date rebuilding that assures "good as new" Banbury mixer performance.

HE CAN ADVISE ON IMPROVING OPERATIONS —

because he has built up a storehouse of "know-how" through his association with Farrel-Birmingham and his many contacts with industry. He can also advise on improved integration of the Banbury mixer with your production system.

HE CAN MAKE PREVENTIVE REPAIRS —

to keep production flowing, and perhaps avert, or at least postpone, the need for major overhaul and parts replacement.

To arrange for an inspection, call one of the offices listed.

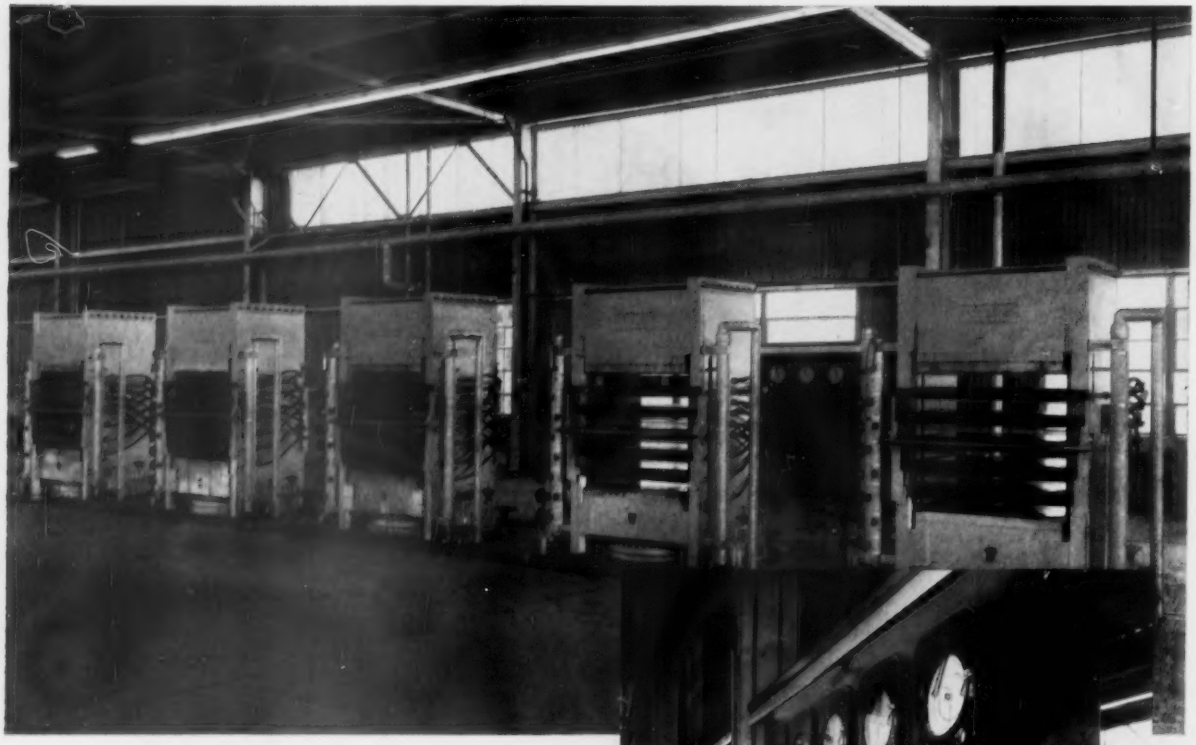
FARREL-BIRMINGHAM COMPANY, INC.

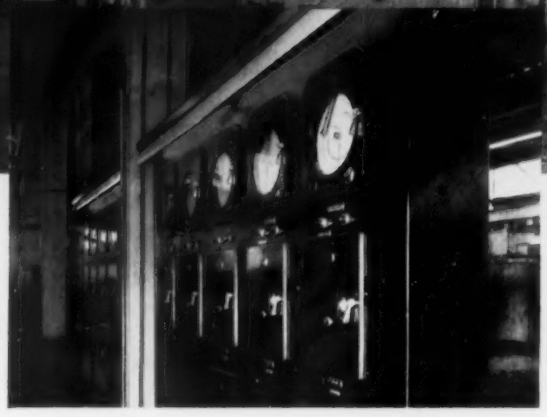
ANSONIA, CONN., (REgent 4-3331)
AKRON 8, OHIO, 2710 First National Tower (POrtage 2-8871)
ANN ARBOR, MICH., 3061 Dexter Road (NOrmandy 2-5978)
CHICAGO 43, ILL., 10725 South Western Ave. (PRescott 9-3421)
LOS ANGELES 21, CALIF., 2032 Santa Fe Ave. (LUdlow 5-3017)
HOUSTON 2, TEXAS, 860A M&M Building (CApitol 2-6242)
FAYETTEVILLE, N. C., P. O. Box 3157 (3-0353)

Farrel-Birmingham ®

FB-1118

SOLE CONTROL





International Shoe Company Bryan, Texas, cures sheet stock automatically with Taylor Controls!

TAYLOR controls on their platen presses provide many benefits for the International Shoe Company.

1. **They protect International's fine name by insuring a uniformly high quality in their sheet stock.**
2. **Press performance is 100% predictable.**
3. **Since the entire sequence and duration of the cure is automatically controlled, production schedules can be set up so that the minimum number of operators can be used for the maximum number of presses. Skilled operators are thus released for other duties.**

The larger photograph above illustrates the battery of French Oil Mill Machinery Co. 42″ x 42″ platen presses, with one of the Taylor instrument panels in the background. Inset picture gives a close-up view of the control panel for ten 30″ x 30″ presses. The FULSCOPE* Controllers at top regulate platen temperature, while the FLEX-O-TIMER* Time Cycle Controllers automatically operate the presses, from closing them through bumping, timing the cure, operating the valves in proper sequence and opening of the presses.

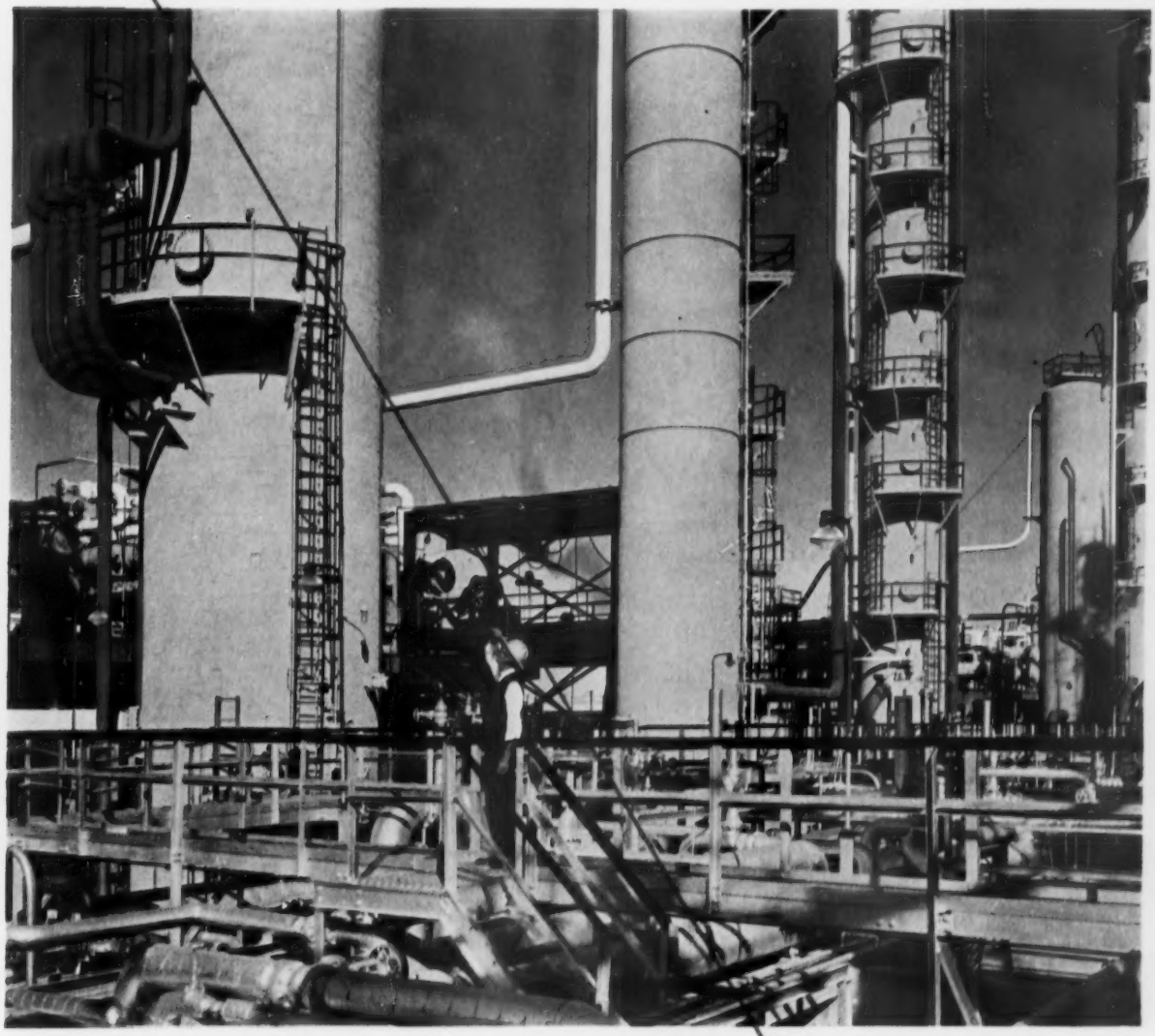
*Reg. U.S. Pat. Off.

Note the "off-the-press" location of all instruments on central panels. This gives more convenient access to working areas and enables operators to check performance at a central point. Better "housekeeping" and care of equipment also results.

To find out how you can profitably put Taylor to work in your plant, call your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

new incentives for new butane-based polymers



Ample, non-captive output of butadiene and related petrochemicals at attractive prices should stimulate production of a wide range of better plastics, fibers, coatings, films, adhesives and other elastomers.

Petro-Tex is uniquely qualified to work with makers of intermediates and end-products in these fields. While continuing as a growing rubber-industry supplier, we are also expanding capacity, product lines and our application research to serve new markets.

We invite confidential discussion of your present and potential needs and will do everything possible to assist in your development of new butane-based polymers.

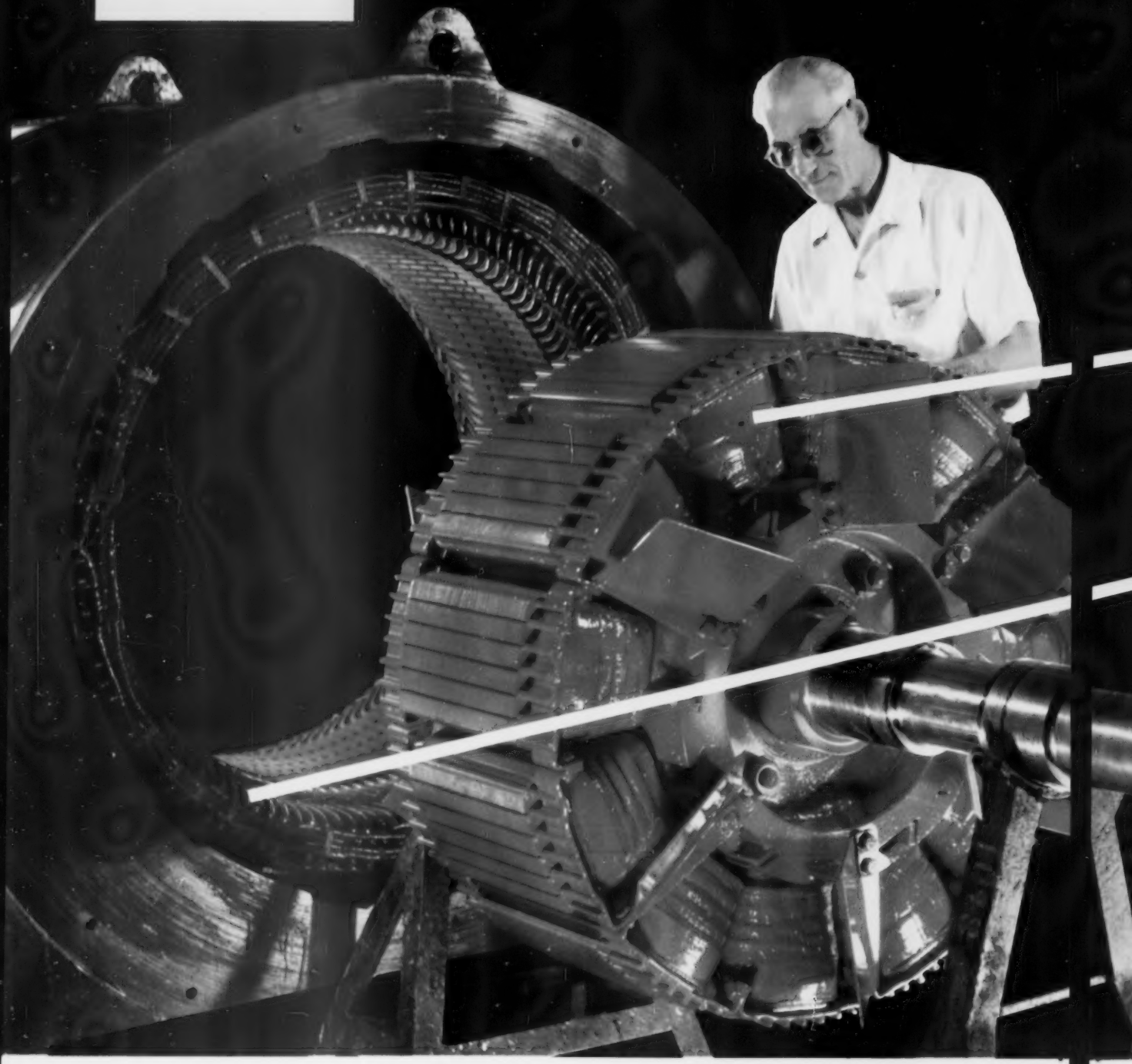
PETRO-TEX CHEMICAL CORPORATION

HOUSTON 1, TEXAS

A JOINT ENTERPRISE OF

FOOD MACHINERY AND CHEMICAL CORPORATION AND TENNESSEE GAS TRANSMISSION COMPANY

ONLY Allis-Chalmers



ALLIS-

MOTORS are "double protected"

New Integrated Field Coils Plus *Silco-Flex* Stator Insulation Provide Superior Motor Protection . . . Under Any Operating Conditions

1

Integrated Field Coils are bonded in heat-stabilized resins, enclosed in a resin-impregnated sheath of oriented glass fibers and bond-locked on the pole structure . . . dimensionally stable to withstand heating and thermal shock, vibration and fatigue at elevated temperatures . . . sealed throughout against atmospheric contaminants and fully protected against destructive forces.

2

***Silco-Flex* Insulation** provides a homogeneous, void-free insulating wall of silicone rubber on stator coils. It is unexcelled in life and thermal stability at high temperatures . . . resistant to most chemicals, water, weather . . . outstanding in flexibility and resilience . . . able to withstand abrasion and corona . . . resistant to physical and mechanical forces.

Exclusive Allis-Chalmers "double protection" is available on large electrical machines with operating temperatures through Class B range.

Silco-Flex is an Allis-Chalmers trademark.

For more information on these quality insulation systems contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin for Integrated Field Coil Bulletin 05R8525 and *Silco-Flex* Insulation Bulletin 05R8341.

Allis-Chalmers "Double Protection," with integrated field coils and Silco-Flex stator coil insulation, adapts this 600-hp, 2300-volt, 600-rpm synchronous motor to the most severe operating conditions.

CHALMERS

A-C ALLIS CHALMERS

A-5221

for **shoe soles** and **top lifts...**

DUREZ resins **aid** in compounding ...**improve** the physical properties of **GR-S rubber** stocks

It doesn't take much! From 5 to 15 parts of a Durez phenolic resin impart just the required amount of boardiness and stiffness to the cured stock. Compounding is easier due to the plasticizing effect of the resin while in the molten stage.

Being thermosetting, the hardness and stiffness of the compound are not materially affected by elevated temperatures. Such compounds containing these Durez resins prevent distortion under the heat and pressure encountered in the sole-attaching operation. The spreading of top lifts due to heat and pressure during use is eliminated. The abrasive resistance of these compounds is also improved.

Whether you are working with GR-S, Buna-N, natural rubber or Neoprene... producing compounded stocks or solvent-type adhesives...Durez resins may help to solve your problems of performance and costs. Let us send you the current edition of our bulletin on Resins for the Rubber Industry.

DUREZ®

Phenolic Resins that Fit the Job

DUREZ PLASTICS DIVISION

HOOKER® CHEMICALS PLASTICS

HOOKER ELECTROCHEMICAL COMPANY

104 WALCK ROAD, NORTH TONAWANDA, N. Y.

Export Agent: Omni Products Corp., 460 Fourth Avenue, New York 16, New York

No NEW Story.....

Wherever the going is "Rough and Tough"

Tires NEED the CUT-AND-CHIP RESISTANCE of...

Vulcan® 6 ISAF
Vulcan® 9 SAF

CABOT

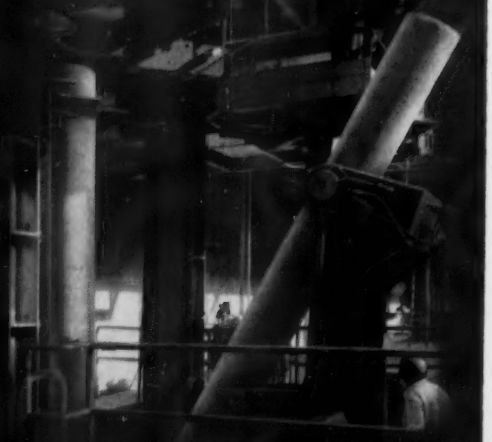
All heavy duty tires need "built-in" resistance to wear and tear . . . the kind provided by Vulcan 6 ISAF and Vulcan 9 SAF carbon black. That's why we specifically recommended these two blacks back in '55 for use in rubber treads where cut-and-chip resistance were going to be most important to tire service life. Now the cry is "Better than channel black performance" from those already convinced. For those who are not, we're saying it again . . . these blacks are especially recommended for the manufacture of off-the-road tires used in mining, logging, oil field, construction and other operations . . . wherever cut-and-chip resistance is essential to a tire tread.

FREE SAMPLES AND TECHNICAL INFORMATION FROM YOUR NEAREST CABOT AGENT OR FROM

GODFREY L. CABOT, INC.
77 Franklin Street, Boston 10, Massachusetts

518 Ohio Building, Akron 8, Ohio
46 Bayard Street, New Brunswick, New Jersey
141 W. Jackson Boulevard, Chicago 4, Illinois
405 Lexington Avenue, New York 17, New York

Special Processing?



Materials Handling?

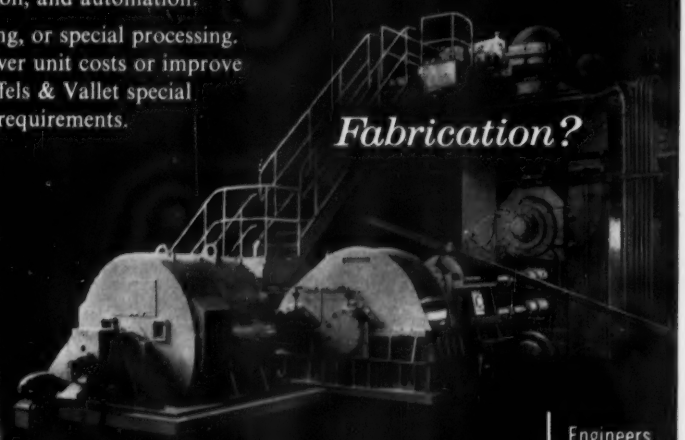
Looking for the Answer to a Tough Production Problem...

Frequently, the design of special machines will provide the answer. Helping management resolve production problems through the application of automated equipment is one of the important services offered by the Giffels & Vallet organization. This machine design service reflects years of extensive experience gained through the planning and engineering of production facilities for companies of widely diversified activity, in every area of industry. These practical insights have proved of great value in analyzing and applying solutions to problems involving special machines, mechanization, and automation.

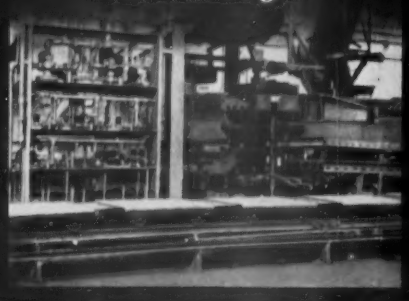
Fabrication, assembly, materials handling, or special processing. Wherever you must increase output, lower unit costs or improve product quality—the application of Giffels & Vallet special machine design services will meet your requirements.

G & V services are discussed in a special Planning Brochure. A copy will be mailed on request.

Fabrication?



Assembly?



INDUSTRIAL ENGINEERING DIVISION

Giffels & Vallet inc.

DETROIT 26, MICHIGAN New York and Houston

Canadian Affiliate: Giffels & Vallet Ltd., Toronto and Windsor

Engineers Serving Industry for Over Thirty Years

Plant Layout · Process Development · Automation Engineering · Materials Handling · Machine Design · Building Design

sunolite®

ANTI-SUNCHECKING WAXES

made by Witco

AND **MADE RIGHT** FOR THE **RUBBER** INDUSTRY

EXCEPTIONAL YEAR-ROUND PROTECTION AGAINST ATMOSPHERE AND CORONA CRACKING!

Witco Sunolite Waxes provide tough protective surface films which prevent checking under all climatic conditions—for they are designed to migrate to the surface at a constant rate regardless of the temperature.

Witco Sunolites are carefully manufactured from selected raw materials, and are odorless and non-staining. Readily dispersed at mixing temperatures, they have no effect on cure.

Five grades of Sunolite Wax are available from Witco, and all of them will give efficient, economical service.

Send for the new bulletin containing complete information on the properties and applications of Sunolite Waxes.

37 Years of Growth

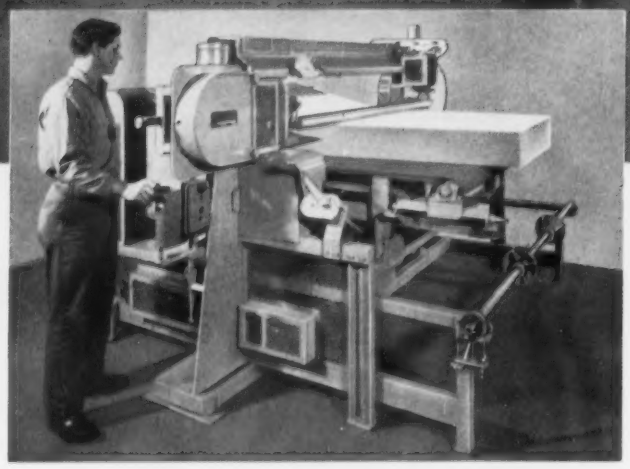
WITCO CHEMICAL COMPANY

122 East 42nd Street, New York 17, N. Y.

Chicago • Boston • Akron • Atlanta • Houston • Los Angeles • San Francisco • London and Manchester, England

Now at Your Service!

FEMCO CUSTOMER SERVICE CENTER



FEMCO announces new facilities for Customer Service — a building entirely devoted to and fully equipped for test cutting your materials on our machinery *without obligation to you!*

Above and at right are views of equipment we have already installed in our Customer Service Center. Customer Conference Rooms and Staff Offices for our Service Department people are also part of our new facilities to serve you better.

Our machines will die cut, split, shape or trim Polyvinyl Chloride Foams, Polyurethane, Plastics, Latex Bonded Foam, Molded Rubber Goods, Rubberized Hair, Cellulose Sponge, Cork, Resin Bonded Fiber, Wood Fiber, Fiberglas, etc., in rolls, sheets or slabs.

Send us any material you want to split, shape, trim or die cut. We'll test cut the samples and you'll get a prompt, complete report on what our machines can do. There is no obligation.

REMEMBER — if you have a stock cutting or splitting problem, we're here to help you. Just call on us.

1917 40th ANNIVERSARY 1957

The FALLS ENGINEERING AND MACHINE CO.

Established 1917

1734 FRONT ST., CUYAHOGA FALLS, O.

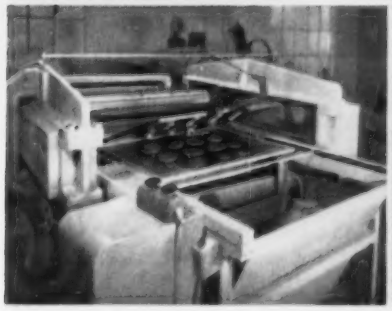
FEMCO'S V-BELT EQUIPMENT

includes Collapsible and Ring Molds, Curing Cages, Autoclave Type Belt Molders, Hydraulic and Manual Manipulaters, Vertical and Horizontal Type Measuring and Matching Machines, Notching Machines, the new and improved V-Belt Skiving Machine, and a new and improved V-Belt Collapsible Building Drum. Call us first for this equipment.

How FEMCO'S new loading and unloading Roller Die SAVES TIME and CUTS COSTS

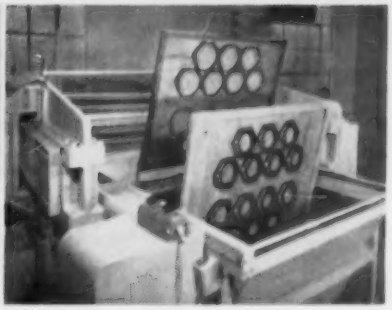
FROM MULTIPLE CURING MOLD TO FINISHED DIE CUT PRODUCT

1. FRAME HOLDING MULTIPLE STEEL RULE DIES IS LOADED



2. MOVES ONTO DIE CUTTER BED

3. PARTS ARE CUT



4. THEY DROP INTO TOTE BOX

This is FEMCO's new automatic Loading and Unloading Heavy Duty Roller Die Cutter. The four pictures, top and bottom, show the four time-saving operating steps from multiple cavity curing molds to the finished die cut product.

FEMCO's new equipment was designed particularly for production die cutting and trimming of molded rubber goods, including small automotive rubber parts such as brake and accelerator pedals, spring pads, etc.

The first saving comes when the mat or sheet of cured molded rubber stock is placed on a multiple steel rule die loading frame *without trimming or cutting the mat.* The fully loaded frame moves automatically onto the bed of the die cutter, and the stock is die cut and trimmed in one operation. Finished parts drop in a tote box for inspection, simply by turning the frame.

This equipment fits Die Cutters with bed sizes 48 x 42, 48 x 72, and 48 x 84. On the two larger size machines the equipment may be attached to each end of the Die Cutter, producing a continuous die cutting process, if desired.

Write, wire or call Falls Engineering and Machine Co. now for full details and prices.

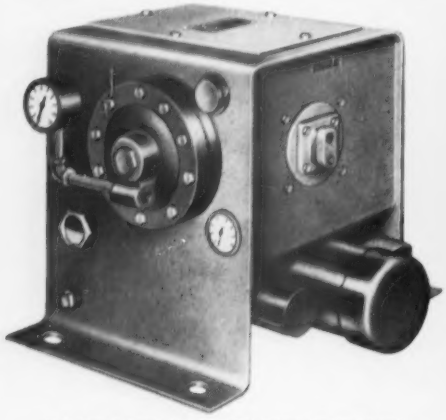
1917 40th ANNIVERSARY 1957

The FALLS ENGINEERING AND MACHINE CO.

CUYAHOGA FALLS, O.

Askania Regulator Company NEWS

Automatic Edge Position Control for Laminators, Slitters, Printers • Adaptable to New or Existing Equipment



Self-Contained Model 550 Edge Guide Ideal for All Types of Light Duty Web Handling Equipment

NEW... Easiest to Install Edge Control Regulator Ever Built!

The new Model 550 Askania Edge Guide is the solution to web handling problems on LIGHT DUTY laminators, printers, slitters.

The Model 550 is easily adapted to new or existing equipment used in the rubber, plastics and paper, film and foil converting fields.

It is more compact—the regulator, pump, motor and oil supply are housed in the *same* unit.

You can INSTALL a Model 550 Edge Guide easier than any other edge guide—a minimum effort is involved.

Askania Edge Guide Controls are Known for Dependability

The same degree of design and construction excellence is incorporated in the Model 550 as is built into the other top quality Askania Edge Controls. You can expect and will get the same performance excellence for your *light duty* operations.

For Example, Check These Advantages

VERSATILE—Guides any material in web form.

SIMPLE—Easy to understand, easy to install, easy to use.

EASY TO MAINTAIN—Needs almost no attention. Any mechanic can take care of it.

DESIGNED BY CONTROL ENGINEERS—Askania Edge Position Control is the only web guide made by specialists in industrial modulating controls.

NON-CONTACT—Nothing touches the web but a breath of air. There's nothing to wear or damage the edge of the material.

DEPENDABLE—Uses the same kind of equipment that heavy industry relies on for the most exacting control jobs. Nothing delicate about it; it's built to take abuse.

ACCURATE—Has never come out second-best in any accuracy test. Proved to be the most accurate web guide on the market.

CONTINUOUS CONTROL—Continuously measures and corrects any runouts. No dead zones. Responds to web position error of half a hundredth of an inch.

NO CLOGGING—Dust, lint, clay or glue will not clog up the control. Use it with dirty materials, or in a dusty atmosphere.

Fill out coupon for your copy of the specific application bulletin you require.

You'll want complete details on what the Model 550 can do for you—how it is used—how it is installed—how it works. Fill out and mail the attached coupon or write Askania Regulator Co., 286 E. Ontario St., Chicago, Ill.

ASKANIA REGULATOR CO. • Chicago, Illinois

Gentlemen:

Send me the application bulletin describing the use of Askania Model 550 Edge Control for:

☐ PAPER CONVERTING ☐ RUBBER ☐ PLASTICS

NAME _____ TITLE _____

COMPANY _____ ADDRESS _____

CITY _____ ZONE _____ STATE _____

ASKANIA REGULATOR COMPANY

"CONTROLS FOR INDUSTRY"

HYDRAULIC, ELECTRONIC CONTROLS & SERVOS, GENERAL SYSTEMS, ENGINEERING & COMPUTER SERVICE, VALVE ACTUATORS & CYLINDERS

A SUBSIDIARY OF GPE

NATIONAL ANILINE DIVISION

ALLIED CHEMICAL & DYE CORPORATION

Aniline is our middle name

WE SURPASS A. C. S. SPECS ON TONNAGE PRODUCTION!

We should know all there is to know about making aniline — we've been a leading producer since 1884. Today, we are delivering a clearer, purer product than ever produced before. It's 99.9+% pure, water-white and exceptionally uniform. Car after car exceeds A.C.S. specifications for C.P. aniline!

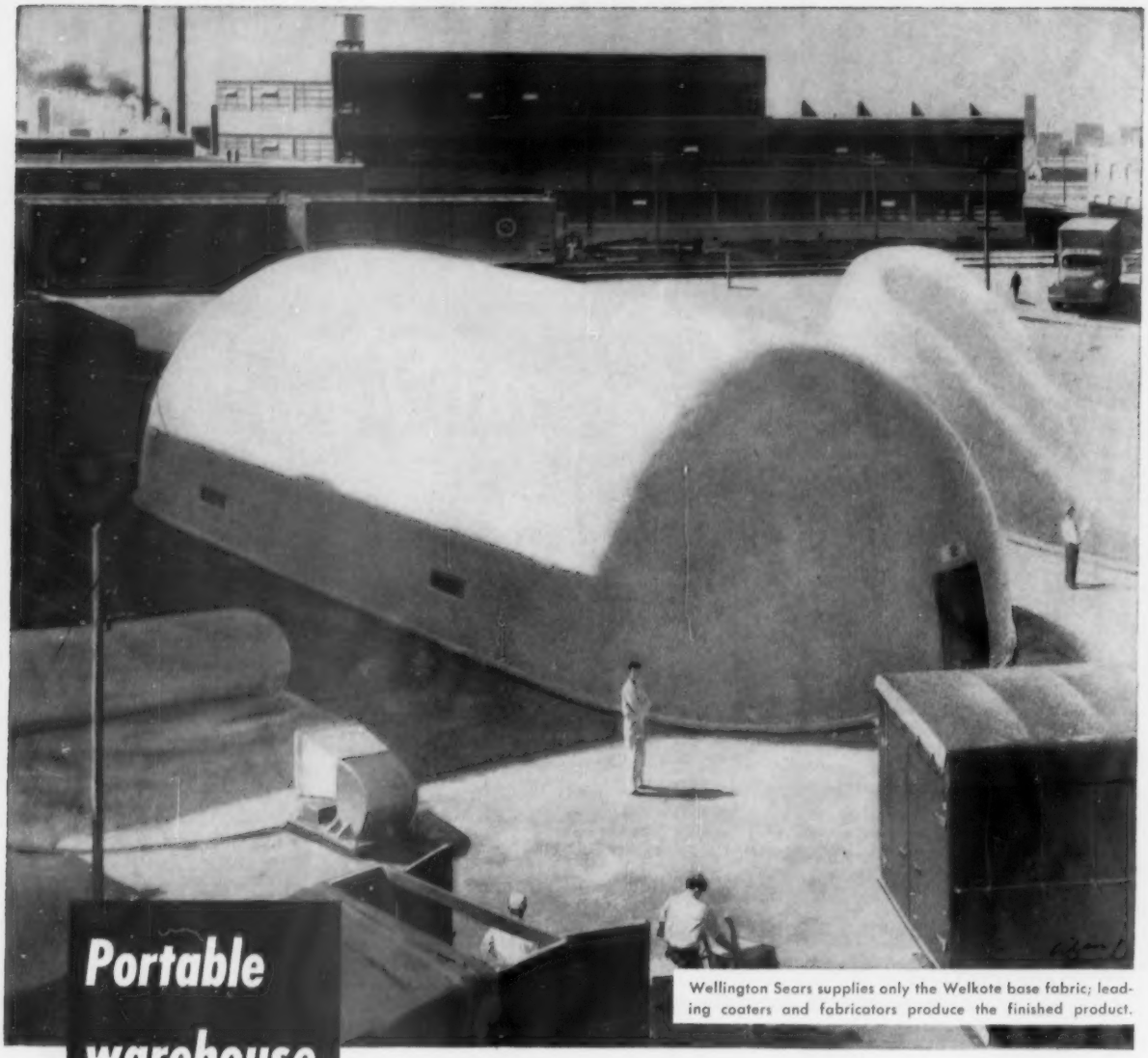
Our recently-doubled continuous plant at Moundsville, W. Va. (just south of Wheeling) assures you of the quantity you need and the purity you want . . . with fast delivery by rail, truck or inland waterway.

We will be pleased to furnish samples, specifications, price and delivery quotation.

NATIONAL ANILINE DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

Akron Atlanta Boston Charlotte Chattanooga Chicago Columbus, Ga. Greensboro Los Angeles New Orleans Philadelphia Portland, Ore. Providence Richmond San Francisco Toronto

Allied Chemical



Wellington Sears supplies only the Welkote base fabric; leading coaters and fabricators produce the finished product.

Portable warehouse made of fabric "lives" on air!

No visible means of support: *air* does it! Now huge vinyl-coated nylon buildings can be easily packed, transported swiftly to a site, inflated on the spot, and start receiving goods for storage in a matter of hours. And constant, regulated air pressure keeps walls and roofs taut even when doors are open!

As in so many new industrial uses of textiles, the rugged nylon base fabric, *Welkote*, is produced by the mills of West Point Manufacturing Company and supplied by Wellington Sears. Welkote is engineered specifically as a base for vinyl and neoprene coating, and is just one aspect of our textile service to all kinds of industries, for all kinds of uses. We've been doing this for more than a century. Surely you can use this experience to help in solving *your* fabric problems!

For informative booklet, "Fabrics Plus," write Dept. G-4.

Wellington Sears

FIRST In Fabrics For Industry

For Mechanical Goods, Coated Materials, Tires, Footwear and Other Rubber Products

WEST POINT TEXTILES

WEST POINT MANUFACTURING CO

Wellington Sears Co., 65 Worth St., New York 13, N. Y. • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

Symbol of Quality

BAYTOWN MASTERBATCHES, manufactured at Baytown, Texas, by *United Rubber & Chemical Company*, offer many advantages to the fabricator.

Here are a few examples—

BAYTOWN MASTERBATCHES are clean. They come to the user uncontaminated.

They're uniform. Specification limits are carefully controlled and maintained.

They're free from undispersed dry carbon black and have exceptionally low marking properties when handled.

And they have proved their utility and reliability—and their constantly improving quality—in factories both here and abroad.

Let our technically trained sales representatives (our sales offices are listed below) tell you how BAYTOWN MASTERBATCHES are being used so widely in tread stocks and other tire applications. Let them outline for you the way these masterbatches have established their excellence for the production of high quality mechanical goods and other molded products.

BAYTOWN MASTERBATCHES . . . the name is a symbol of quality!

UNITED CARBON COMPANY, INC.

A subsidiary of United Carbon Company

CHARLESTON 27, WEST VIRGINIA

NEW YORK	AKRON	CHICAGO
BOSTON	LOS ANGELES	MEMPHIS

IN CANADA: CANADIAN INDUSTRIES LIMITED

Another first from Monsanto

Elastopar—Puts Springy Life Into Butyl Rubber...Chemically... Without Heat Treatment

The word is out: "Butyl can go into dozens of new uses"... and, without changing your processing methods. With a boost from a new chemical modifier, butyl will find its own place among rubber products, and perhaps in completely new uses.

NEW DEVELOPMENT

Monsanto in collaboration with Esso research has developed a new product that increases the modulus and resilience of butyl rubber—*under standard processing conditions.*

This new concept in butyl modification involves a reaction of the butyl rubber with a chemical additive, N-methyl-N, 4-dinitrosomethyl aniline—trade-named by Monsanto: Elastopar. Adding Elastopar to the Banbury creates a chemical modification of the butyl polymer. You get this modification *using normal times and temperatures of mixing.*

Elastopar is effective in both black-loaded and non-black butyl rubber stocks. It is non-scorching. Elastopar actually aids processing. The modified butyl may be cured with conventional vulcanizing systems.

LOTS OF APPLICATIONS POSSIBLE

As soon as you take two pieces of stock in your hands, one modified with Elastopar, one not—you can quickly feel the improved resilience and snap.

Improved resilience is just one advantage. Here's a quick run-down on other ways Elastopar improves the properties of butyl:

- Vast increase in modulus.
- No increase in hardness.
- Raises resistance to abrasion.
- Lowers low-temp flexibility.
- Increases electrical resistivity in carbon black systems roughly from 10^6 to 10^{14}.
- Reduces cold-flow of uncured stocks.
- Lowers Mooney viscosity.
- Does not affect cure.

NEW MARKETS FOR BUTYL

One significant effect in the end-product: Elastopar checks the tendency of early experimental butyl tires to develop excessive heat from absorbed road shocks.

But of more immediate interest—the excellent solvent resistance, gas retention, and high dielectric properties of butyl can be put to use in cable coating, automotive "air springs," gaskets, and mechanical goods. For more information on how Elastopar can help you build-in new profit-making properties in butyl, call or write today.

Accelerators—*For fast, slow, and regulated rates of safe cure.*

Antioxidants—*For maximum oxidation resistance.*

Plasticizers

Specialty Processing Compounds

You can *feel* the difference instantly—but watch! Stock at right, unmodified butyl. At left, modified with Elastopar. See what happens.

Sample modified by Elastopar, left, flattened completely in 3 seconds. This new resiliency is just one of nine valuable properties butyl rubber offers when *chemically* modified with Elastopar.

ELASTOPAR: Reg. U. S. Pat. Off.

MONSANTO

MONSANTO CHEMICAL COMPANY
Rubber Chemicals Dept.
Telephone: HEmlock 4-1921, Akron 11, Ohio

Grommet

Hose

Bathing Cap

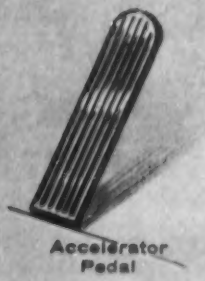
Plunger

Ventilator Seal

TILTING HEAD PRESS

Molds Stay Put —
Operator Removes Work

Caster Wheel



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Foot Pedal

Accordion Seal

Valve Stem

EQUALLY GOOD FOR DEEP, SHALLOW OR TRANSFER MOLDING

The Tilting Head removes the strain of shifting, lifting and horsing heavy molds. Molds fasten to platen. Jaws open—operator removes work. Molds are filled—press closes. High unit platen pressure.

Above you see a few examples of articles now produced on Tilting Head Presses in use. You can adapt the Tilting Head for shallow, deep or transfer molding.

Write for illustrated folder or request showing of 16 mm film showing complete cycle operation. Address inquiry to: Hale and Kullgren, Inc., 613 E. Tallmadge Ave., Akron 10, Ohio.

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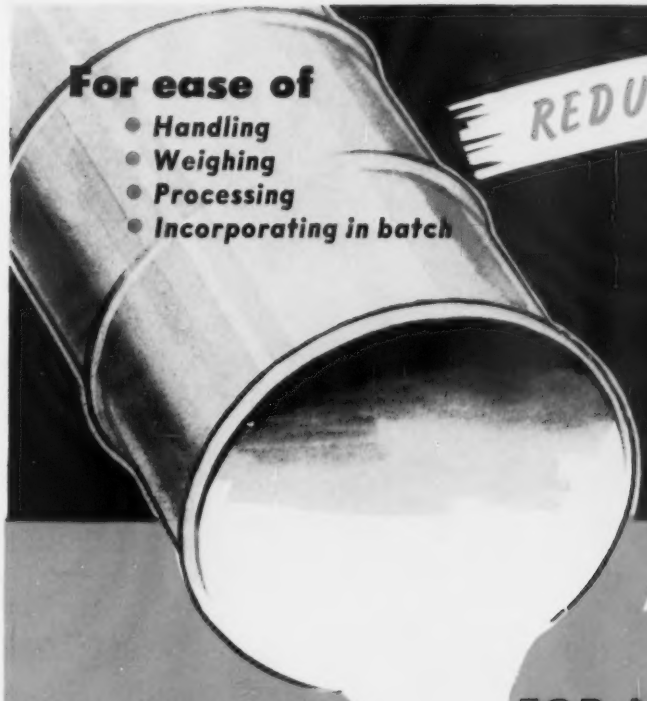

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- *Processing*
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- AUTOMOTIVE MOLDED PRODUCTS
- PRESS ROLLERS
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Compounding Ingredients for Reinforcing, Plasticizing, Extending and Processing Natural and Synthetic Elastomers.

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Natural State	Powder	Specific Gravity	1.11
Color	Amber	Melting Point	Pressure Sensitive
Composition			Modified Polystyrene
Odor			Characteristic
Toxicity			Not known to be toxic

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5000 lbs. to truckloads	.13¾¢ lb.
Truckloads	.13¼¢ lb.

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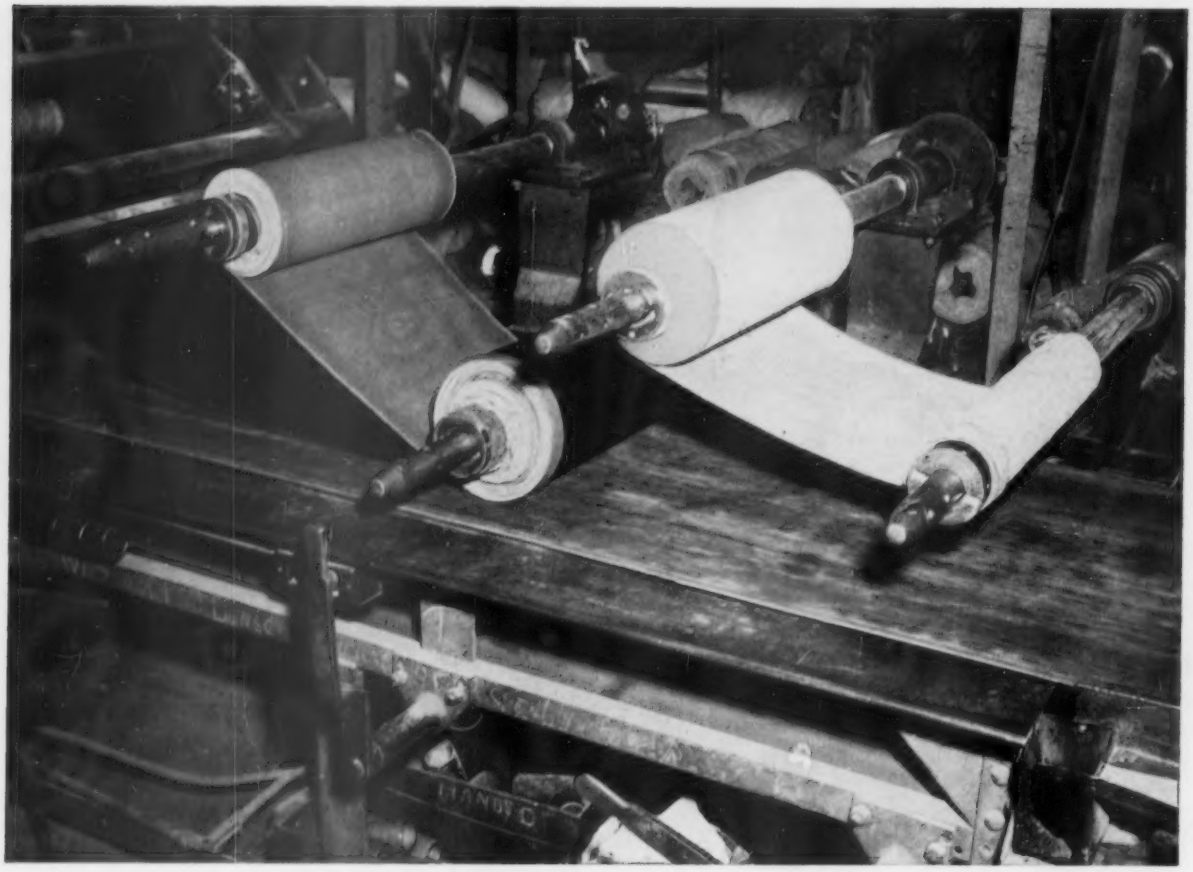

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To Prevent Sticking

At the bias cutter, cut bands will not stick if they are rolled into liners.

Besides preventing adhesions, Climco Processed Liners help all along the line to eliminate tie-ups that cost production time and money. Lint and ravelings, air, moisture, sunlight are excluded—oxidation, mold and bloom are prevented. Tackiness is preserved.

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Whatever your requirements in red pigments, one of these efficient Cyanamid pigments can meet them:
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The "mainline" belt system consists of 2 individual conveyors, each approximately 4,000 ft. long pulley to pulley, laid out to meet the irregular terrain. Successive loads from a continuous line of 35-ton dump trucks are required to keep the system feeding at its peak capacity.

Shown here is one of two 72" conveyor belts that carry rock and earth to the lakeside after it has been deposited in a surge pile by the mainline conveyor. These feeders transfer gravel to two recovery conveyors which can fill a 3,200-ton barge in only 15 minutes!

AN EARTH-MOVING EVENT

This huge 54" conveyor system – nearly two miles long and traveling at speeds up to 850 feet per minute – is the longest downhill conveyor of its kind ever built. Capable of transporting 75,000 tons of material a day, it was manufactured by Hewitt-Robins for Morrison-Knudsen Company, Inc., and is being used to haul 30,000,000 tons of rock and earth required for the foundation of a 13-mile roadbed now under construction across the Great Salt Lake for the Southern Pacific Railroad. The system is equipped with special Hewitt-Robins patented drive mechanisms which not only act as an efficient braking system for the long down-grade, but generate enough electricity to serve 4,000 average homes. The belting itself is more than 23,000 feet long and required for its construction a special Mount Vernon fabric which was delivered to Hewitt-Robins in record time.

This is another example of how fabrics made by Mount Vernon Mills, Inc. and the industries they serve, are serving America. Mount Vernon engineers and its laboratory facilities are available to help you in the development of any new fabric or in the application of those already available.

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Goodrich-Gulf introduces Ameripol "crumb rubber" to save you processing equipment and cost

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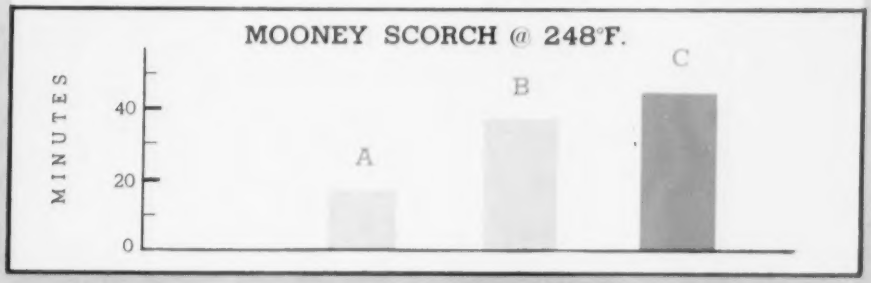
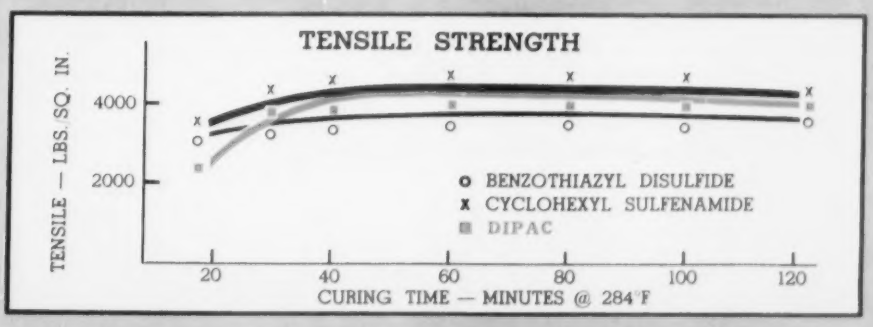
Cyclohexyl Sulfenamide	—	0.50	—
DIPAC	—	—	0.50
Totals	165.05	164.75	164.75





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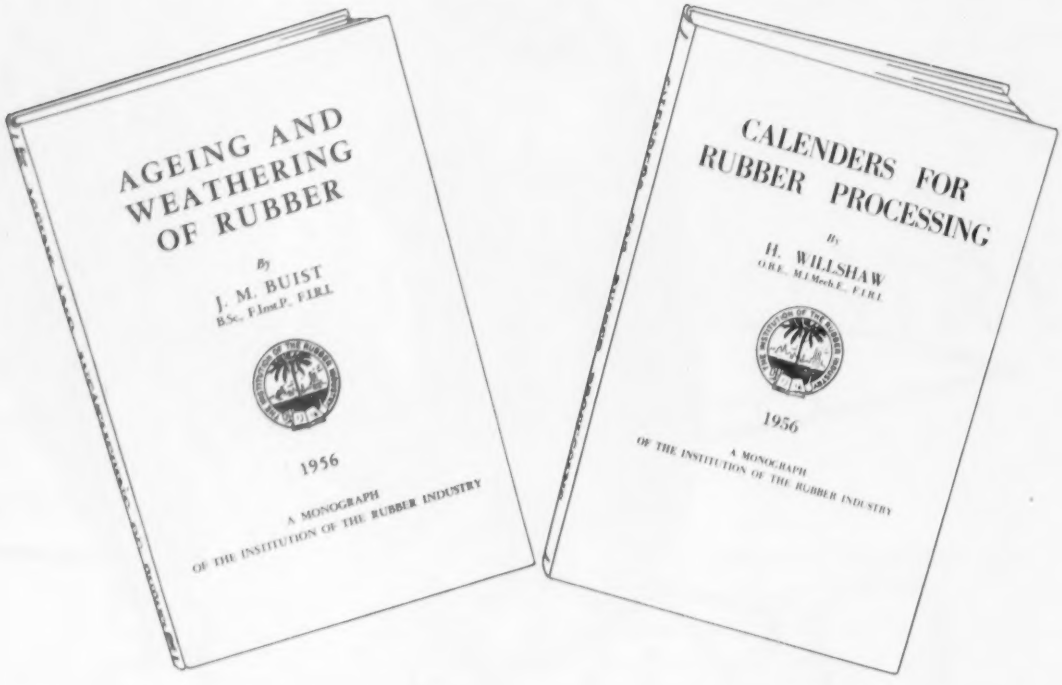

AGEING AND WEATHERING OF RUBBER—by J. M. Buist. This monograph, prepared under the auspices of the Institution of the Rubber Industry, London, England, is intended as a guide to the theory and practice of the aging and weathering of rubbers. Excellent progress has been made in recent years to improve the older techniques for studying this problem. Several refinements, which have enabled more reproducible results to be obtained, throw new light on how the degradation of rubber proceeds. The newer test methods present their own problems of interpretation, and the field of testing remains full of interesting and exciting research problems. Price: $4.00.

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Now you can have additional time to arrange for advertising space in the rubber industry's most widely used reference book.

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- Bright and permanent non-staining colors
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The butadiene-styrene copolymer 1502 has a long-standing reputation for excellence in the sole and heel, and tire industries.

Now with improvements made by TEXUS (Texas-U. S. Chemical Company) which include the use of a *new non-staining* stabilizer, SYNPOL 1502 may be used for products requiring bright, stable colors. In the making of white or brightly colored food conveyor belts, floor tiles, mats, electrical jacket stock, tires or lightweight chemically blown shoe soles the properties of SYNPOL 1502 are particularly applicable.

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Take advantage of carload discounts by pooling all your requirements from SYNPOL grades and types—the broadest available line of butadiene-styrene type rubbers which includes: 1000, 1001, 1002, 1006, 1007, 1009, 1012, 1013, 1061, 1500, 1502, 1551, 1703, 1707, 1708 and 1711.

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... and you will prefer these white pigments—whether your plastic or rubber products are in sheet or other form.

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TITANIUM PIGMENT CORPORATION

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4 NEW SUN RUBBER PROCESS AIDS

extend an already versatile list of products to fill all your processing requirements. Sun Oil Company's industry-leading list of high-quality products grows and grows to give you greater flexibility and economy in compounding and processing natural and synthetic rubbers.

PRODUCT	APPLICATION
CIRCOSOL 2XH. An elasticator of special hydrocarbon structures derived from petroleum.	Manufacture of oil-extended polymers. Plasticizer and softener for butadiene-styrene polymers, natural rubber, and combinations of both.
CIRCO LIGHT. A general-purpose, naphthenic type softener.	Manufacture of nonstaining reclaims and butyl inner tubes. Processing regular neoprene and natural rubber.
SUNDEX 53. A moderately aromatic product compatible with natural rubber, regular neoprene, and butadiene-styrene polymers.	Manufacture of oil-extended polymers. Processing tire tread stocks, rubber footwear, matting, toys, semihard rubbers, etc. Extending high Mooney Neoprene type WHV with a maximum loading of 50 parts per 100 parts neoprene.
SUNDEX 1585. A predominantly aromatic product compatible with natural rubber and butadiene-styrene polymers. NEW	Particularly useful in the manufacture of oil-extended polymers where easy processing and optimum aromaticity are required.
SUNDEX 85. Highly aromatic product compatible with natural rubber, butadiene-styrene polymers, neoprene (regular and WHV), and acrylonitrile polymers. NEW	Manufacture of low cost neoprene articles. Particularly useful for extending neoprene with exceptionally high loadings—75 to 100 parts Sundex-85 to 100 parts neoprene type WHV.
SUNDEX 170. A relatively aromatic product with a high molecular weight.	Manufacture of mastic floor tile, battery cases, and resinous binders.
SUNDEX 41. A complex, dark colored blend of high molecular weight petroleum fractions and a specially prepared asphaltum.	Processing natural rubber and butadiene-styrene polymers.
SUN PROCESS AID 515. A nonstaining, highly paraffinic type petroleum derivative with a low viscosity and fair processing ability.	Manufacture of butyl inner tubes. Processing natural rubber and butadiene-styrene polymers where color stability in the finished vulcanizate is important.
SUN PROCESS AID 551. A nonstaining, highly paraffinic type product with a low volatility, medium viscosity, and fair processing ability. NEW	Manufacture of oil-extended polymers where nonstaining of the finished commercial article is important.
SUN PROCESS AID 594. A medium viscosity, naphthenic type petroleum derivative with a low volatility and good processing ability. NEW	Manufacture of oil-extended polymers. Dry mixing process for natural rubber and butadiene-styrene polymers. Economical where some discoloration in the finished rubber can be tolerated.

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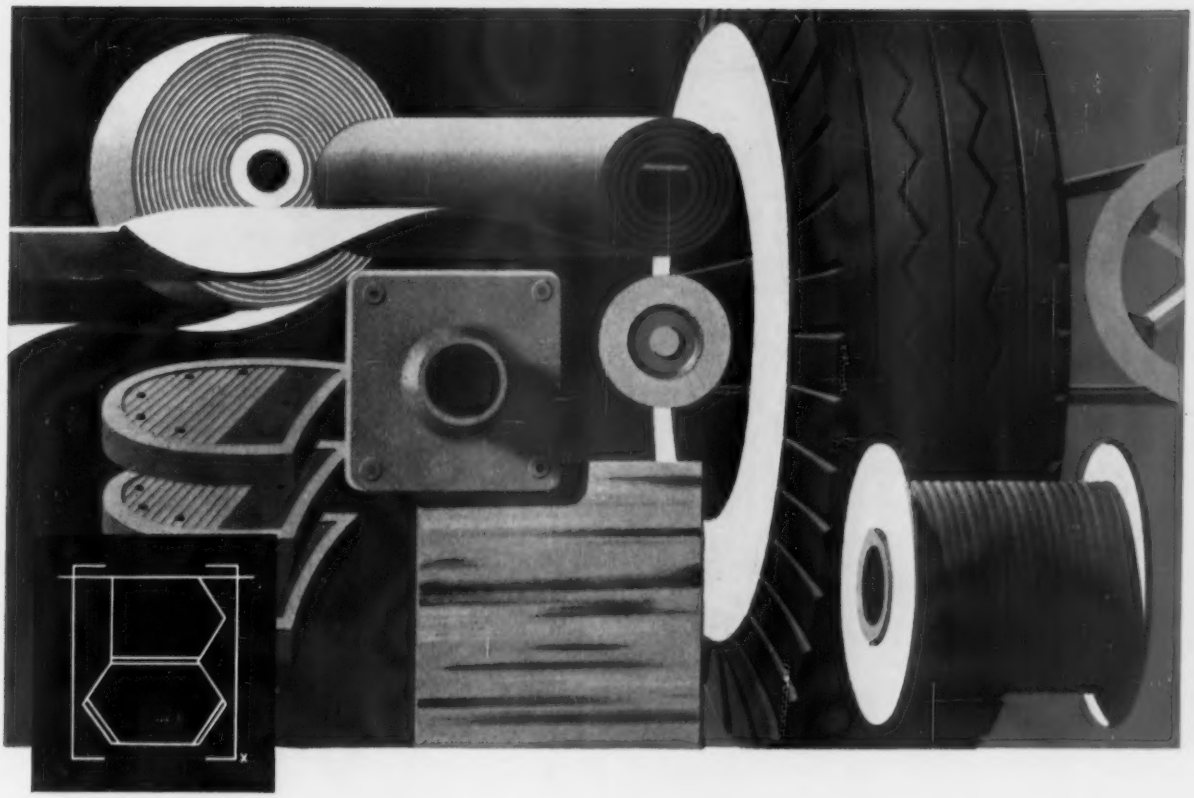

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SCOPE

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CONTENTS

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II—Advantages of Reclaimed Rubber
III—Types of Reclaimed Rubber
IV—Compounding of Reclaimed Rubber
V—Commercial Uses of Reclaimed Rubber
VI—Appendix
VII—Index

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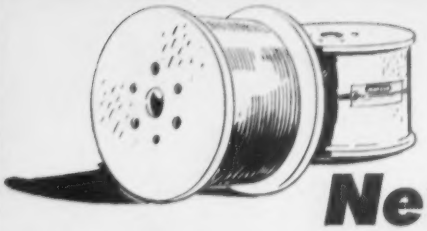
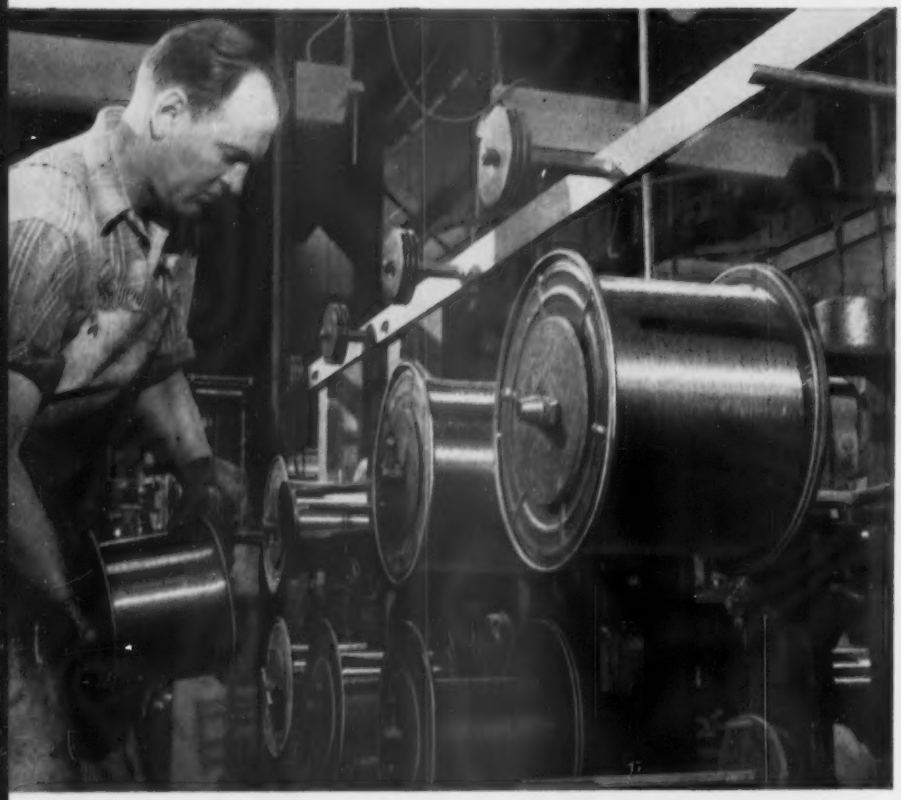


New Discard-a-Spool

Reduces Thermoid's Wire Rewind Loss to ½ of 1%



Light-weight Discard-a-Spool fits easily and quickly on let-off equipment.

Discard-a-Spool cut wire losses in rewinding to less than ½ of 1 per cent.

Johnson Steel's New One-Way Spool Weighs 28 Ounces vs. 200 Ounces

In a mountain-lined valley in Utah, a year-long test of an improved method of packaging fine wire has been stamped "a complete success."

Thermoid Western Division, Thermoid Company, Trenton, N. J., one of the nation's top manufacturers of wire-reinforced rubber hose, has given full approval to Johnson Steel & Wire Co.'s new Discard-a-Spool.

Light-weight, non-returnable Discard-a-Spool underwent testing in actual production at Thermoid's plant for many months. The result: now Thermoid specifies that all hose wire be delivered on new Discard-a-Spools.

Discard-a-Spool offers you these advantages over competitive packaging methods, whether made of metal or tempered Masonite:

- **It weighs only 28 ounces** and slashes tare weight by 14 times.
- **Fully protects the high quality** hose wire from contaminants and in-shipment damages. Overlaps and tangles are eliminated, the wire's critical surface finish is guarded.
- **Shrinks Thermoid's wire losses** in re-winding to less than ½ of 1 per cent.

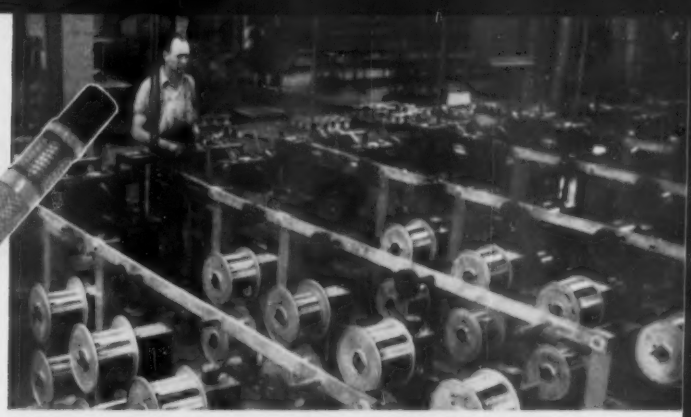
Through substitution of Discard-a-Spool for the heavier, must-be-returned steel spool formerly used, Thermoid computes substantial savings.

A typical package of the new wire consists of 36 Discard-a-Spools in a sturdy, two-layer cardboard box. The box is steel-strapped to a wooden pallet for easy handling by fork-lifts. The entire package weighs approximately 2,385 pounds gross, or 2,250 pounds net, producing a tare weight of 135 pounds.

Using outmoded, heavy spools, which weighed about 12½ pounds and had to be returned to the wire mill, tare weight was 1,023 pounds for the same quantity of wire.

- **Major Supplier**—In the past 21 years, Johnson Steel & Wire has become one of Thermoid's major suppliers of hose wire for a wide variety

Johnson's high-quality hose reinforcement wire is fabricated into braids which form plies of strength around rubber tubing. As many as four braids can be plaited into reinforced rubber hose. At right, cut-away section shows plies of wire separating layers of rubber.



Johnson Steel is a major supplier of the high quality hose reinforcing wire Thermoid Western uses at its Nephi, Utah, plant. For 18 months, Thermoid cooperated with Johnson Steel & Wire Co. in extensive production tests of the new Discard-a-Spool.

of high-strength rubber hoses.

At Nephi, Utah, Thermoid's hose wire braiding machines convert Johnson's wire into plaited sheaths around rubber tubing. The number of braids in a hose is determined by the end use of the hose. Thermoid builds dozens of different types of wire braided hose, ranging from $\frac{3}{16}$th inch to 4 inches in diameter. They vary from hose with a single ply, or layer, of plaited steel wire to 4 plies of practically unbreakable wire plaiting.

In a standard 50-foot length of four-ply, $2\frac{1}{2}$ inch hose, 38.5 miles of Johnson wire is used, fitting it for tough hydraulic pressure jobs like core, water and oil well drilling and sand busting in the oil fields.

Without steel reinforcing, rubber hose has a bursting resistance of only about 50 p.s.i. In the case of half-inch reinforced hose, the first ply of braid raises bursting strength from 50 p.s.i. to 10,000 p.s.i. A second layer increases it to 16,000 p.s.i. These are minimum figures, since Thermoid actually builds its hoses so that breaking points are four times maximum working pressures on the hose.

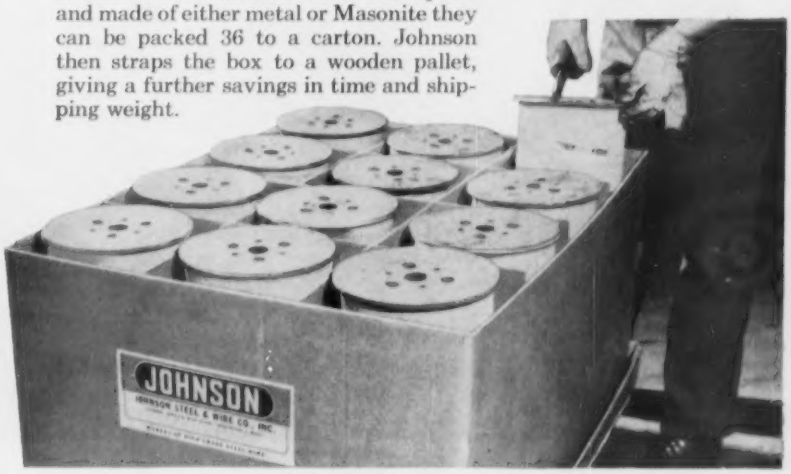
According to J. A. Muller, Thermoid's Director of Research and Development, the secret of building good hose rests on a number of factors. Among them is steel wire of high quality.

Thermoid selects Johnson wire because its structure meets or exceeds specifications. The wire surface is free of nicks which could cause premature fatigue stress or breakage during braiding operations.

• **Cleanliness Vital**—Good adhesion also requires a wire with a clean surface. To get superior adhesion Thermoid uses a dry assembly process for hose components.

These advantages of Johnson's wire are not the only benefits Thermoid gains. Johnson's products stay within the specified tensile ranges.

Discard-a-Spools are lighter and easier to handle than returnable hose wire spools and made of either metal or Masonite they can be packed 36 to a carton. Johnson then straps the box to a wooden pallet, giving a further savings in time and shipping weight.



Variations in tensile can cause serious trouble in the braiding operations.

"Any deficiency in the wire shows up in winding or during the braiding operation itself," Mr. Muller explains.

It takes up to eight hours to set up the 120 bobbins on the big braider. One bad wire is enough to jam the machine and the cost to get it set up again is figured at $245—$35 for labor and $210 for damaged and lost wire. The time lost adds still more expense.

The Utah plant, far from the nation's wire producing mills, requires tops in quality and service.

Thermoid's experience with Johnson Steel & Wire Co. demonstrates why you should let Johnson handle your fine wire supply problems.

Johnson's full range of specialty wires and its progressiveness are your guarantee of satisfaction. Let a Johnson specialist explain how top quality wire or the latest packaging improvement—like the new Discard-a-Spool—can eliminate your worries. The Johnson man is experienced and willing. He's as close as your telephone. Give him a call today.

Johnson Steel & Wire Company, Inc.

Worcester 1, Massachusetts

a subsidiary of **Pittsburgh Steel Company**

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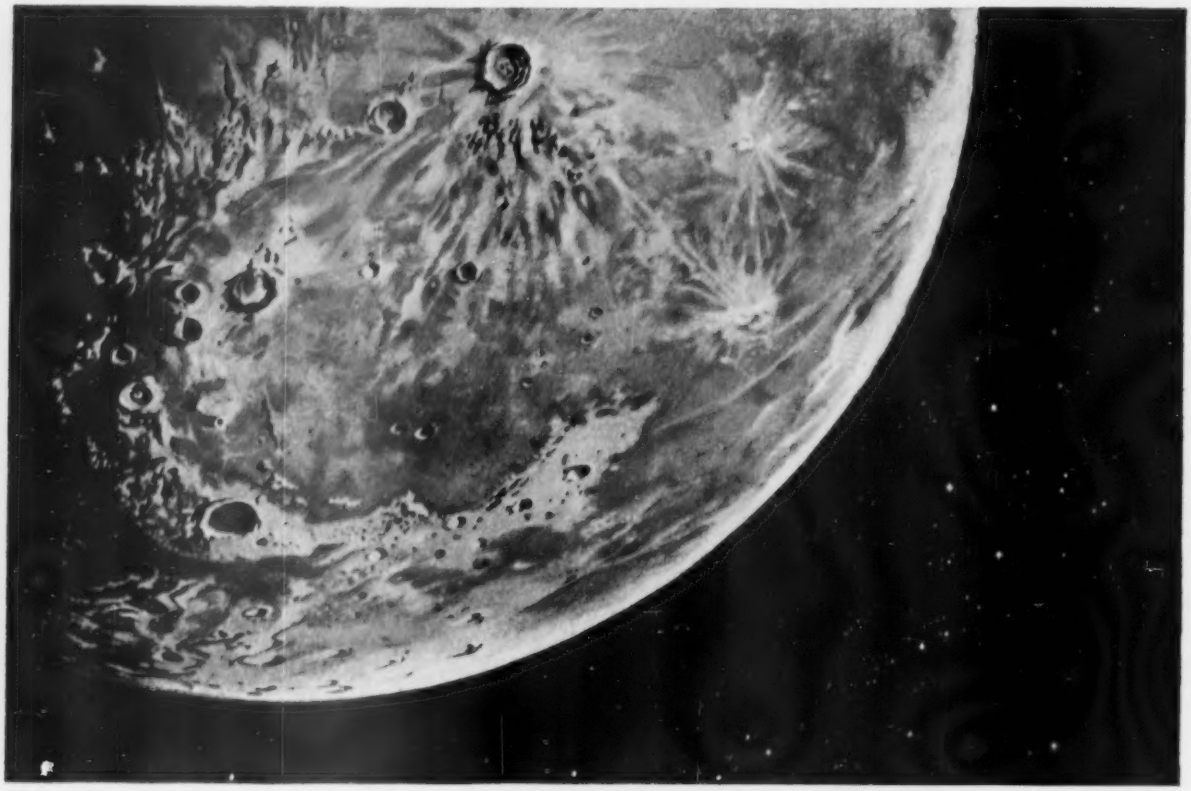

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Rubber Age

Vol. 81, No. 1 APRIL, 1957

How Voit Rubber Increased Productive Capacity

through installation of a high pressure Banbury-extruder combination

By G. R. GONYER

Chicago District Manager, Farrel-Birmingham Co., Inc., Ansonia, Conn.

THE W. J. Voit Rubber Corp., producers of tread rubber or camelback, last year faced a problem at its Portland, Oregon plant which is becoming more and more common in the industry—that of acquiring additional mixing capacity. Increasing competition and rising labor costs dictated an expansion which would make the plant as efficient as possible, reduce labor costs to a minimum, and yet retain the flexibility necessary to small plant operation, in which frequent stock changes are the rule. The Voit plant handles 25 stocks.

Several executives from Voit visited a number of installations and reviewed the problem with equipment manufacturers. Possible answers ranged between two extremes: one, a conventional Banbury-mill installation with relatively high labor costs; the other, a high pressure Banbury-extruder combination designed for complete automation. The cost factor ruled out the first, and decreased flexibility, plus the fact that the quantities of carbon black and chemicals were too small to permit complete automation, eliminated the second.

The compromise approach adopted by the Voit officials was to install the high pressure Banbury-extruder combination, but also to use a skilled operator capable of performing all operations manually, located where he could see all steps of the operation, and provided with controls to permit any combination of operations from completely manual to almost completely automatic. This can be seen in Figure 1, which shows a schematic layout. Note the operator's relationship to all the equipment.

It was realized that to obtain the productive capacity required and yet keep the capital expenditure down, it was essential to install the most efficient equipment available as well as all the proper accessories necessary to both feed and take away from the unit. Many plants

G. R. GONYER began his association with Farrel - Birmingham Co. in 1937. He was in production control from 1941 to 1945, and in sales from 1945 to 1948, when he joined the firm's Chicago office. Mr. Gonyer became Chicago District Manager for Farrel-Birmingham in 1953. He is a member of the Chicago Rubber Group and the Fort Wayne Rubber and Plastics Group, and has served on the Boards of Directors of both organizations.

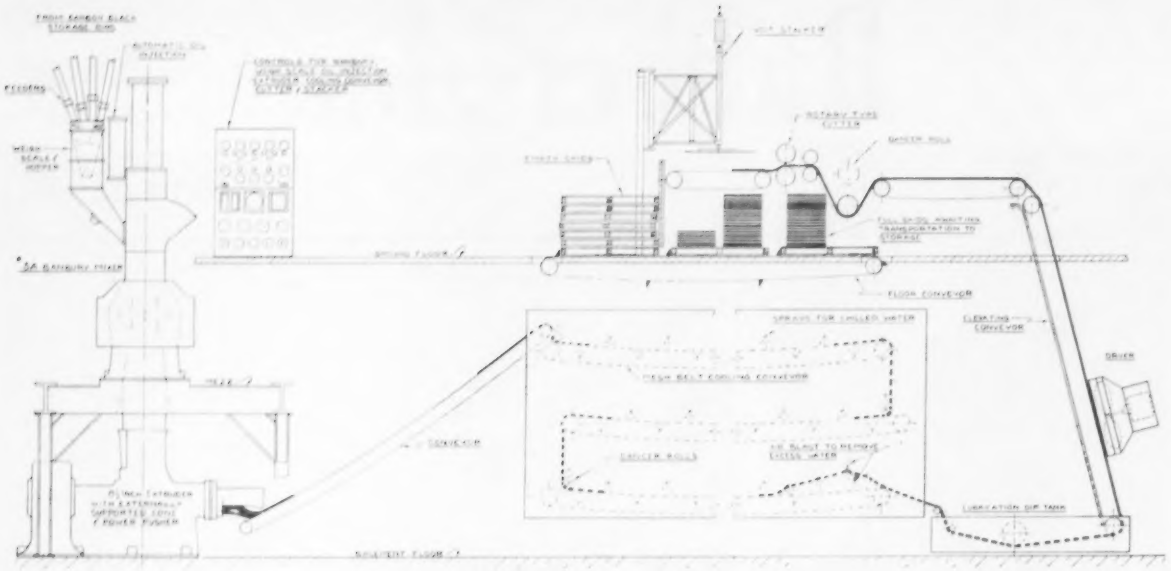


FIG. 1—Schematic layout of equipment for the preparation of tread rubber stock at the Portland, Oregon plant of the W. J. Voit Rubber Corp.

have purchased efficient equipment but have failed to provide the proper accessories for loading and unloading. It was also realized that to reduce labor costs, it was necessary to have as much mechanical equipment as possible for loading and unloading, as well as the most nearly continuous operation possible. However, flexibility still had to be maintained so that stock changes would be neither complex nor time consuming.

After visiting a number of installations and discussing problems with both rubber and equipment manufacturers, Voit decided upon a size 3A high pressure Banbury and a 12 x 8½-inch extruder with an externally supported cone-type head. These were the basic pieces of equipment around which the plant was laid out, and to serve which all of the other equipment in the layout was designed.

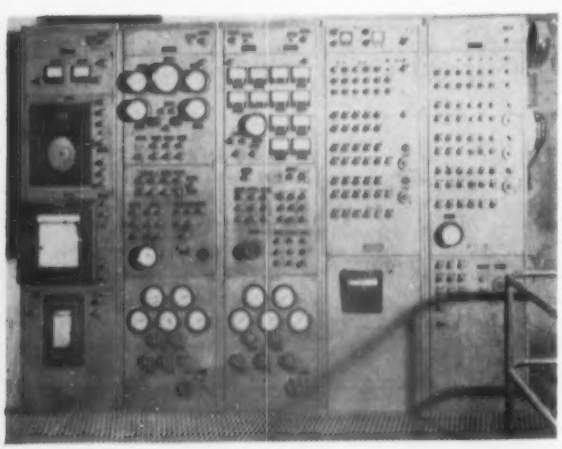


FIG. 2—The control panel for the equipment is divided into five parts. On the left is the Banbury instrumentation section, followed by controls for the Banbury, the extruder and conveyor, the carbon black system, and the oil handling system.

It was decided to erect a one-story building to separate this equipment from the existing operation. In the building would be automatic handling, weighing, and loading of carbon black, mechanical delivery to the Banbury, pre-blending of dry powders, automatic oil injection into the Banbury, cooling conveyors, dip tank, slab cutter, and automatic stacking device. All of these are indicated in the schematic layout (Figure 1) and are also shown in subsequent illustrations.

In order to handle all of this equipment a control panel, elaborate in appearance but simple to operate, was designed. This panel covers every phase of the complete operation, and permits the Banbury operator to control it from start to finish. He can see the various steps and can also tell by lights on the panel the conditions which exist in various phases of the operation (Figure 2).

The control panel is the heart of the complete operation. As will be noted in Figure 2, it is divided into five sections. The first contains instrumentation for the Banbury. At the top are an ammeter and a voltmeter for high and low Banbury motor speeds, 35 and 70 rpm. Next is the automatic-sequence-cycle timing device, then the potentiometer which both indicates and records temperatures. Below is the indicating and recording wattmeter.

The second section of the control panel contains all of the Banbury controls. Here are buttons and switches for controlling operations of the floating weight, sliding door, hopper door, and high and low pressure air, as well as water connections for every part of the Banbury with their respective pressure gauges. These were found to be more accurate than thermal elements for controlling cooling water. There are buttons for manual operation as well as for automatic operation. In addition, there are lights for indicating whether the sliding door is open or closed, whether the Banbury is running in high or low speed, and other conditions as they exist. Switches and lights for the operation of lubrication equipment are also provided.

The third section of the panel controls the extruder and the cooling conveyor. The left half of the third section has a rheostat for controlling the screw speed, an indicator showing the screw rpm, various electrical gauges, and lights indicating different conditions. In addition, the bottom of this section has valves and pressure gauges controlling the flow of water to all sections of the extruder.

The right-hand side of section three controls the various units of the conveyor. This is divided into five separate units, each driven by a DC motor. The speed of each unit is indicated on the panel board, and each can be controlled separately.

Section four of the control panel is for the automatic black-handling system. On this section are bin selector switches for the type of black, dials controlling quantity, buttons for controlling every step of the operation, either manually or automatically, and lights showing conditions.

The fifth section of the control panel handles the oil injection system. Six oils are used, any three of which can be delivered into one batch, and three of which are heated continuously. This panel contains oil selector switches, quantity dials, and lights indicating which oils are being used, whether discharging or reloading, manual or automatic operation, and whether heaters and pumps are operating.

It might be mentioned here that there are lights of three colors on the panel—red, green, and amber. Any time the operator sees a red light it indicates that a particular step is not operating properly, and corrective action must be taken. Green, of course, shows that all is well, while the amber is used for intermittent functions.

The Banbury operator's platform is a steel grating. As he is standing directly over the extruder, he can see into the hopper of the extruder, and watch the stock coming out of the head end. He can also observe the stock as it starts into the cooling conveyor, and see the cutting and stacking operations.

FIG. 3—The storage tank on top of the building is divided into five pie-shaped bins which contain the four carbon blacks and the sawdust used by Voit.

FIG. 4—Loading carbon black into the storage system. The push-button panel controls the bin selection.

Raw Material Receiving and Storage

Natural and synthetic rubbers are both used and are received in conventional bale form and stored in the warehouse until ready for use. Process oils, of which there are six, come in 55 gallon drums. Sulfur, accelerators, and other dry chemicals are received in conventional drums, while carbon blacks and sawdust are received in bag form in box cars. In making winter retreads different materials are used to create small holes with rough edges in the tread to give better gripping action on smooth, slippery surfaces. This company uses a small chip of wood about 3/32-inch square and 1/32-inch thick.

The first sign of automatic handling appears with the carbon black. Most plants considering automation use enough carbon black to warrant having storage tanks capable of holding two or more hopper cars at a time. This justifies bulk delivery by hopper car, underground removal from the car, and air or bucket conveyor delivery to large overhead storage tanks. The quantity to be used at the Voit plant, however, was not sufficient to justify that method. It was planned to use four types of carbon black and one of wood chip and it was felt that all of these could be handled successfully by the same system.

A large tank (Figure 3) capable of holding approximately 80,000 pounds was installed on the roof of the one story building. This tank is divided into five pie-shaped sections, four for carbon black and one for the sawdust. The black is received in conventional bag form in box cars at an unloading dock adjacent to the black storage room. Immediately inside the unloading dock door is the loading hopper (Figure 4). The inclined, totally enclosed, belt conveyor delivers the black into the storage tank. The operator slits the bag, dumps the contents into the hopper onto the belt, and the black is carried up the conveyor. This is one of the few belt conveyors in use for handling loose black.

The panel board immediately in front of the operator has push-button selection enabling him to choose the section of the bin to which the material is to be delivered by controlling a swivel-type discharge nozzle at the top of the tank. A light indicates the bin which is being filled. Bin-level indicators show when any given section is full. There are also both high and low-level bin indicators on the control panel, letting the operator know when bins are full or when they are getting low, so that he may have his assistant refill the empty ones.

Compounding

It was early realized in the planning by the Voit officials that if labor costs were to be held to a minimum and the intended equipment utilized to its best advantage it would be necessary to mechanize as many of the operations as possible. It was fully recognized that flexibility still had to be maintained, since many small special orders are handled in small plants of this type.

Before discussing the actual processing equipment, it should be stressed that this article is concerned only with the mixing and handling of the rubber compound prior to its being warmed and extruded as tread rubber. The extrusion is more or less conventional and will be dealt with very briefly.

The rubber, of which more than one kind may be used in a given batch, is cut on a conventional guillotine bale cutter, weighed, put on trays suspended from an overhead monorail, and delivered directly to the throat of the Banbury (Figure 5). These trays are not spaced at any given intervals. This irregularity is intentional, as it permits the man doing the weighing to weigh 10, 20 or 30 batches in advance, and then perform some other function. Using the overhead monorail instead of a floor-mounted conveyor keeps the Banbury hopper completely accessible to the operator for cleaning as well as for observation. The tray swings across directly in front of the throat, the chunks of rubber are pushed into the hopper and the empty tray returns around the loop and back to the weighing section.

The carbon black and sawdust are contained in the large storage tank on the roof directly over the Banbury. It is delivered down through vertical tubes into a weigh hopper directly behind the floating weight cylinder on the Banbury. On the control panel (Figure 2) the operator has selector switches enabling him to take black or sawdust from the five bins and another dial which permits him to set the quantity required. Any two blacks may be used in the same batch up to a maximum of 70 pounds. The operator sets the selector switch, adjusts the quantitative dial and pushes the button. The black is automatically weighed, held in the weigh hopper, and at the proper moment is delivered through the back door of the hopper into the batch. The weigh hopper is then automatically refilled with the proper amount. This

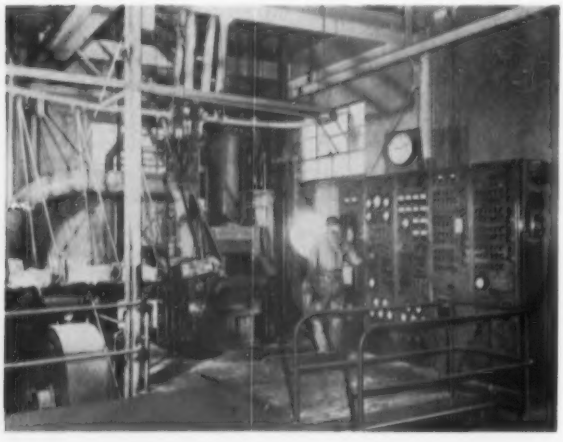


FIG. 5—A view of the Banbury showing the trays of rubber to the left, the carbon black pipes above, and the oil-injection cylinder on the right. The operator's platform is a grating.

FIG. 6—The dry materials are mixed in the preblender, which is being loaded on the right. The Syntron vibrating screen feeder for filling bags with correct weights is operated by the control panel on the right.

operation can be controlled by pushing separate buttons for weighing, discharging, and refilling, or can be made part of the over-all completely automatic control.

As is true with most rubber compounds, from two to five dry chemicals may be used in any given batch. In this particular operation these are all small quantity, ranging from a few ounces to two or three pounds each. In most rubber plants these are weighed out by a compounder into small paper bags of varying sizes, delivered to the Banbury, along with the rubber in a tote pan, and loaded separately into the Banbury.

In the Voit operation a somewhat different approach is used. All of the dry powders are weighed out in quantities equal to 100 or 150 Banbury batches. These ingredients are loaded into a hopper, passed through a crusher for breaking up the small lumps, dropped onto a conveyor belt and fed into a large Sigma-bladed type dry mixer. All are mixed together for perhaps ten minutes, and then, by means of a Syntron vibrating feeder and automatic scale with control panel, are delivered into paper bags in the amounts needed for one Banbury batch. Materials are put on skids and held in the warehouse until required, at which time the operator's assistant delivers a pallet full of bags to the Banbury and the operator adds one bag of dry powders to each batch. Part of this process is illustrated in Figure 6.

Automatic Oil-Injection System

Six different process oils are used in this plant, any three of which may be delivered into the same batch. Three of the oils are of a type which require continuous heating, so heaters are contained in the storage tanks and the oils are continuously circulated through a bypass arrangement. An automatic oil-injection system, seen on the right of Figure 7, is used. It consists of a metering cylinder, a pressure cylinder, and a differential transformer capable of handling up to 250 fluid ounces and suitable for delivering any combination of three oils into the same batch. The oil is delivered through the unused thermocouple hole in the mixing chamber end

frame. An injection nozzle is included which opens under pressure but which, when closed, prevents stock from plugging the inlet hole. The system is capable of 550 psi but actually operates at about 150 psi. Controls on the panel (Figure 2) enable the operator to select the proper type of oil and the correct quantity. Button combinations are such that he can discharge the oil into the Banbury with one button, refill the system with the proper amount by a second button, or have the entire operation controlled by the automatic-sequence-cycle timer.

Mixing

Three basic operations are performed in this Banbury-extruder combination—crude rubber breakdown, masterbatching, and sulfuring. This means that all synthetic rubber passes through the Banbury twice, and natural rubber three times. Despite this, production is in excess of 700,000 lbs. per month of finished product.

These operations are common to many plants, except perhaps for the methods of delivering raw materials, the mixing cycles, and the extrusion of sulfured stock in slab form. By proper sizing of the extruder in relation to the Banbury no rise in temperature occurs while passing through the extruder. Crude rubber breakdown requires approximately four minutes, masterbatching 2½ minutes, and sulfuring less than 1½ minutes. These are complete Banbury cycles, not just mixing cycles.

The operator, as is customary, has a batch card indicating the particular stock which he is to handle. He can run the operation either manually or with the automatic timing device. In either case, rubber, black, oil and chemicals are added; only the degree of automation is different.

On a conventional masterbatching operation, one or more types of rubber weighed out are available to the Banbury operator on the trays carried by the monorail (Figure 5). The tray passes across the throat of the Banbury, and the operator, with one motion, pushes the rubber into the hopper. The empty tray swings around the loop of the monorail and goes back to the weighing section.

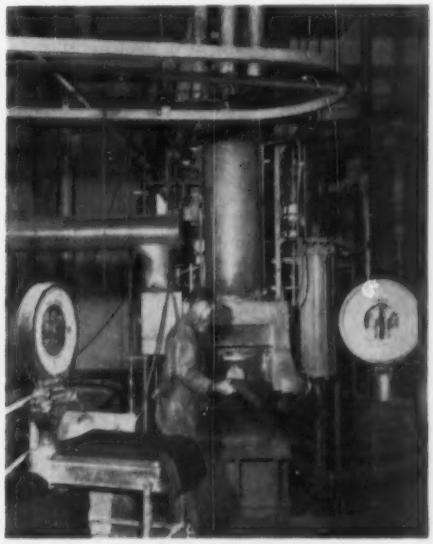


FIG. 7—The operator is seen loading slabs for sulfuring. The large cylinder to the right is the oil-injection system for the Banbury.

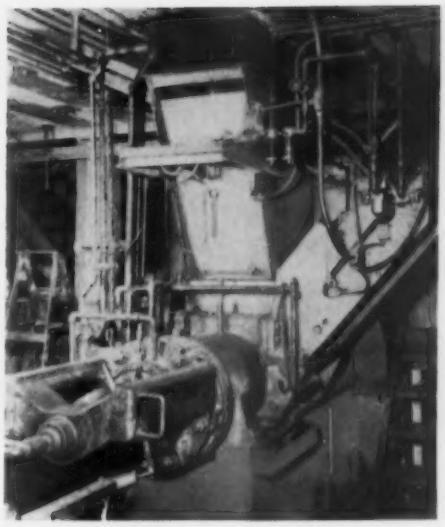


FIG. 8—A view of the front portion of the extruder, showing the hopper and the pusher mechanism.

The operator then pushes one button which sets the complete Banbury cycle into operation. He has already selected on his control panel the proper type and quantity of black, or blacks, and oils, and has switched these controls to the automatic position. When the start button is pushed, the hopper door opens and the operator loads the rubber in the front door, carbon black is delivered through the back door, the ram goes down, oil is injected, and mixing proceeds for a prescribed interval. The ram may be raised once for a brushdown or scrapedown.

In some batches, the dry chemicals are added with the rubber, in which case the operator dumps the contents of the paper bag into the hopper with the rubber. In other instances, these are held out and added when the ram is automatically raised. Then the ram goes down until the cycle is completed, the gate opens, the batch discharges, the gate closes, the ram comes up, and the machine is ready for its next charge. In the meantime, as the blacks and oils are automatically charged into the Banbury, the weighing units are automatically recharged so as to be ready for the next batch.

A complete charge of black can be delivered into the Banbury in less than 20 seconds, with less than 60 seconds being required for recharging. A complete charge of oil is delivered in less than 20 seconds, with approximately 30 seconds necessary for recharging.

The Banbury operator, as already stated, can observe the hopper of the extruder through the grating on which he stands. A rheostat lets him control the extruder screw rpm so that the sheet is continuous and the least amount of stock always remains in the hopper of the extruder. The sheet is hardly ever broken but is marked at change-over time. The part which may be mixed or contaminated stock is set aside and worked away later in small quantities. This has been found to be the most practical method for handling stock changes, as it eliminates threading.

As the batch is discharged from the Banbury into the large hopper of the extruder (Figure 8), an automatic air-operated ram supplied with the Farrel extruder and

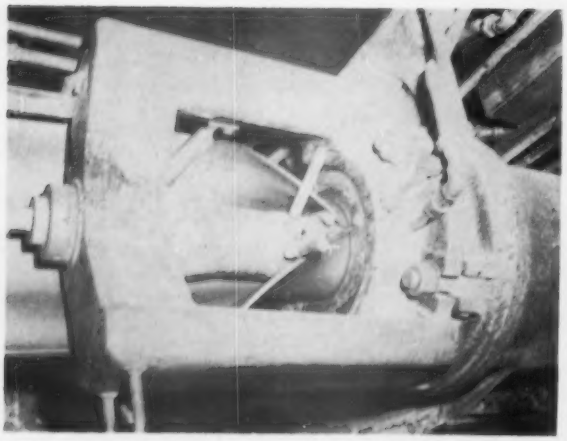


FIG. 9—The extruder seen from above as the tube is split and laid out flat with rollers.

located on the right keeps forcing the mass of rubber into the flutes of the screw which prevents bridging in the hopper, maintains uniformity of flow, and gives more uniform density.

The stock is extruded around an externally supported cone in tube form, is slit and laid out in a sheet, as can be seen in Figure 9. Any thickness up to about ¾-inch can be produced, although normally approximately ¼-inch is the best average. Gauge control is quite important if the automatic stacker is to be used, as will be observed later.

From the nose of the extruder (Figure 9) the stock goes up an inclined conveyor into the cooling conveyor. This conveyor, shown in Figure 10, is a three-deck, chain-mesh, waterspray cooling conveyor with dancer rolls at the end of each section over which the sheet passes. Each of the three sections is separately driven by a DC motor which permits variations in speed control of plus or minus 15 per cent. This is necessary, of course, due to shrinkage in the rubber sheet as it cools. Each section of the conveyor can be controlled separately, and in addition, the Banbury operator maintains

FIG. 10—The three-deck water-spray cooling conveyor. The sides are removable for inspection

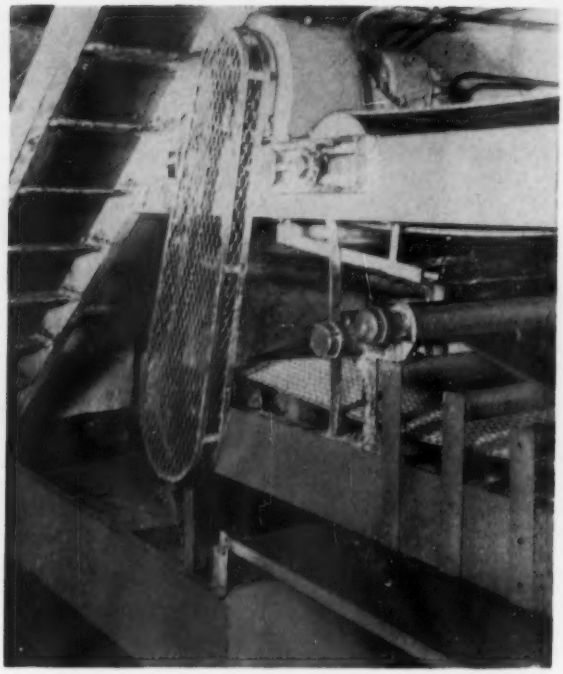


FIG. 11—A view of the discharge end of the cooling and conveyor dip tank.

over-all speed control of the entire conveyor installation, so as to properly synchronize it with the output of the extruder.

At the far end of the cooling conveyor the stock passes through a dip tank (Figure 11) for coating with a non-sticking solution. From here it is picked up and carried back up to the first floor on an inclined conveyor, during which time the excess water is blown off and the stock is completely cooled.

Figure 12 shows the automatic cutter with the sheet passing under a dancer roll just before going through the cutter. This, of course, is to keep the cutter operating in proper relation to the cooling conveyor.

The automatic cutter consists of a pair of pinch rolls for pulling the sheet in, a cutter roll carrying a knife blade, and an anvil roll. As will be noted in Figure 13, which shows the knife blade, there is a small die-cutting device directly above the blade which marks out a circular piece approximately 1¼ inches in diameter. This piece is cut almost completely through so that it can be removed with the fingers, and is used by the laboratory for checking. Any sheet, or all of them, may be checked at any time prior to warming for tread extrusion.

In Figure 12 the automatic stacker is shown just as it has picked up a sheet. This stacker swings 90 degrees, and deposits, not drops, the sheets on the pallet. The V in the center of the stack is caused by a variation in gauge. Small variations do not hamper automatic stacking but too much variation can cause trouble as the sheets will not line up accurately. Gauge variations mean nothing in manual stacking. Another view of the automatic stacker is shown in Figure 14 at the moment of depositing a sheet on the pile. This picture shows how accurately the sheets are stacked when gauge control is correct. The edges of these sheets look as though they were lined up with a straight edge. The slabs are 20 x 40 inches and the pallets are exactly 42 inches square.

Figure 12 also shows in the foreground the floor-level

FIG. 12—The cutter from the feed side, with the dancer roll below. The stacker at left-center has just picked up a sheet. Note the V-shape of the stacked sheets at the left.

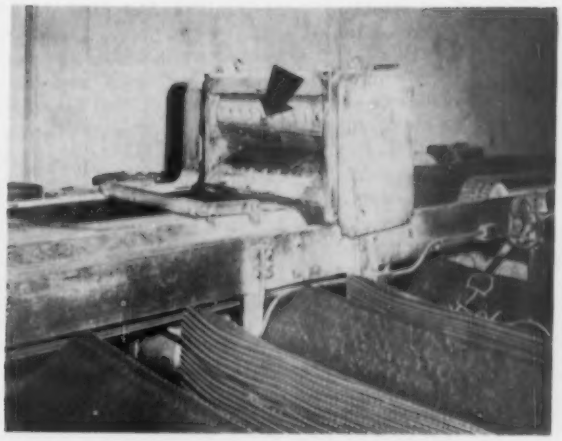


FIG. 13—A view of the discharge side of the cutter, showing the cutting blades and die cutter (arrow) for laboratory samples.

chain conveyor which carries the full pallets away from the stacker. At the far left of this picture, as well as in the left-hand corner of Figure 14, a hopper which is filled with empty pallets is seen. This stacker has an automatic counter, which, after recording that the proper number of sheets has been stacked on one side of the pallet, actuates the chain conveyor and moves the pallet approximately 21 inches to start a new stack on the same pallet. The empty pallets are stacked vertically in the hopper very much like packs of cigarettes in a vending machine. As the hooks on the chain conveyor pass underneath, they pull out the bottom pallet, and the others drop down.

The counter on the stacker can be set so that after a predetermined number of strokes, a cam offsets the pick-up head three inches and one sheet is then offset three inches on the stack. This enables the operator to glance at a skid and know that there are 50, 80 or 100 sheets without counting them. This can be an important time-saving feature on the sulfuring operation (illustrated in Figure 7). This photograph shows slabs of rubber being brought to the Banbury. If, for example, a sheet weighs 14 pounds and the batch size is 140 pounds, then every tenth sheet is offset. The Banbury operator simply picks up the sheets he needs as indicated by the offset one without having to actually count them.

The chain conveyor is long enough to carry 20 or 25 full skids. When the Banbury operator's assistant has free time, he uses a fork truck to carry the skids to the warehouse and stack them for future use. These stacks of sheets are subsequently returned to the Banbury for sulfuring or are delivered to the extrusion department. Here the stock is warmed on mills in the conventional manner and either calendered for liners or extruded as tread rubber, cooled, marked, lined, cut, rolled, boxed, and shipped.

One man weighs dry chemicals while another cuts rubber, loads the carbon black bins, and acts as a helper to the Banbury operator.

Although it is not contemplated that the use of black will grow to the extent that larger storage bins will be necessary, nevertheless provision has been made. The layout is such that a large, ground-level, storage bin can be installed outside the building immediately adjacent to the railroad tracks and to the hopper feeding the conveyor belt (Figure 4) going to the storage bin. This will permit, if and when necessary, the delivery of bulk black by hopper car, transferral to the ground-level storage tank, and removal from there by screw conveyor into the hopper feeding the overhead storage bin.

Conclusion

The Voit installation is designed primarily for small plant operation and modification of the layout could be adapted to many smaller plants. Complete utilization is being made of the efficiency of high pressure Banbury mixing. Many people have the erroneous impression that, because the Banbury runs faster and with more pressure, all they have to do is put in a machine of this type. Actually, a great deal of auxiliary equipment is necessary if a high pressure Banbury-extruder combination, or any other really efficient piece of equipment, is to be utilized to its fullest extent.

What would appear on the surface to be a rather minor point, but one which has been found to be extremely

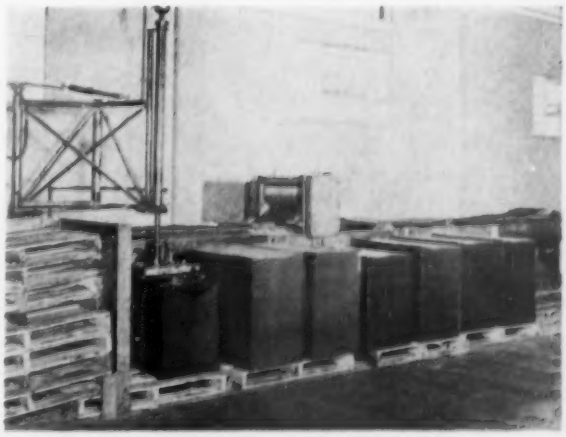


FIG. 14—The stacker depositing a sheet on the pallet, with the cutter in the background and the pallet hopper to the left. Note the regularity of the stacked sheets.

important in the operation of this Banbury, is the frequent cleaning of the inside of the hopper. High pressure Banburys have close fitting rams, and, as is well known, when combinations of rubber, black, and oil are used, the surfaces become so gummed up that no amount of pressure will raise the ram. Suitable sharp-edged cleaning or scraping tools are provided to the operator, and it is required that he keep the inside walls of the hopper scraped down to bare metal at all times. He scrapes after every batch, and very thoroughly after every eight or ten batches.

Two air pressures are available for the Banbury, 40 and 120 psi, and these are on a 16-inch cylinder, which gives four times the pressure of the 8-inch cylinder on a standard 3A. The 40 psi is used for sulfuring, while all other stocks use the 120 pound pressure. Four solenoid valves operate the pressures, which permits the operator to make a very rapid change from one to the other.

One thing stressed in the physical layout is accessibility. Everything has been so arranged that it is possible to get to any piece of equipment without interference. For example, it will be noted in Figure 10 that the complete cooling conveyor has sides which can be removed in sections so that any point may be checked. In addition, the dip tank, storage conveyor, cutter, stacker, pallet hopper, and other pieces of equipment are all completely accessible. In a layout of this type, in which anything wrong can shut down the entire operation, it is important that even minutes be saved in making adjustments or repairs.

It will be noted in Figure 1 that the Banbury operator stands at ground level and everything is designed around him. The building is only one story in height so that the overhead storage tank is not too high. The raw materials are delivered on this level, which eliminates the necessity for elevating any of them except the black, which goes into the storage tank, and the finished sheet comes off the conveyor back onto the same level. There are four levels, as indicated in the diagram; three of them are below ground level, but also so designed that complete accessibility is maintained.

While this installation was designed for a particular plant, it nevertheless was built around two basic pieces of equipment—a high pressure Banbury and a slabbing extruder. Many combinations of these can be made, with different sizes, various head designs, and changes in horsepowers and speeds to suit the given conditions, thus enabling all types of plants, such as tire, mechanical goods, heel and sole, battery, sponge, and many others, to increase their efficiency as well as their productive capacity by proper planning.

Farrel-Birmingham now offers an engineering service to assist rubber plants in the engineering, selection, and installation of various types of mechanical equipment to further mechanize operations. This, after all, is the first step toward automation with its increased productivity at lower cost.

Coming Next Month...

"Compounding Rubber for Resistance to Silicate-Ester Types Hydraulic Fluids at 400°F. I—Neoprene WRT" —By L. E. Novy and R. A. Clark, Rubber and Plastics Division, Battelle Memorial Institute, Columbus, Ohio.

The first part of a two-part article covering the development of practical rubber compounds that can be used in contact with silicate-ester fluids used in supersonic aircraft. The first part considers Neoprene WRT, while the succeeding part, to be published in a subsequent issue, discusses nitrile, vinyl pyridine, butyl and acrylate polymers.

"Blends of Carbon Blacks in a Nitrile Rubber Compound"—By Z. Rigbi, Rubber Research Association, Ltd., Ir Ganim, Israel.

In which the author discusses blends of MT, SRF and FEF carbon blacks in a nitrile compound. Both technical and economic aspects of the problem are considered and test results offered.

"Procedure in Obtaining Patents"—By Kenneth W. Brown, Arthur S. Collins and Curt B. Beck, Godfrey L. Cabot, Inc., Boston, Mass.

Is the inventor's "brainchild" patentable? When should he submit his application and how is it to be prepared? Of what value is a patent? These and similar questions are dealt with in a series of articles beginning in the May issue.

"How to Apply X-Ray Analysis Techniques to Rubber Problems"—By Vern W. Palen, North American Philips Co., Mount Vernon, N. Y.

A consideration of the X-ray diffraction instruments which find use in the solving of difficult problems in the rubber industry. The applications of the X-ray Diffractometer and the X-ray Spectrograph to these problems are outlined.

Physical Testing in the Rubber and Plastics Industries

Questions and Answers at the Symposium of the Akron Rubber Group

IN the March issue of RUBBER AGE a report was given on the symposium held by the Akron Rubber Group at its Winter Meeting on January 25, 1957 at the Sheraton-Mayflower Hotel in Akron. Six panelists participated in the program, which was entitled "Physical Testing in the Rubber and Plastics Industries." They were: David C. Scott, Jr. (Scott Testers); John T. Blake (Simplex Wire & Cable); John H. Dillon (Textile Research Institute); John W. Liska (Firestone); Sherman R. Doner (Raybestos-Manhattan), and W. Newlin Keen (DuPont). L. V. Cooper (Firestone) acted as panel moderator. The papers presented by the panelists were printed in the report given in March. Herewith is a transcript of the questions-and-answers which followed the presentation of the papers.

Question—Approximately what percentage of capital outlay should be invested in testing equipment and what portion of personnel for testing?

Answered by Dr. Blake: If we omit that part of the expenditure for testing which is used to service research and development, the answer to this question can be reduced to a problem in economics. Testing is required to insure the production of saleable and serviceable goods. The ultimate in testing demands the detection of all off-grade products before they get into the hands of the customers. Such a program would involve much equipment, a large staff and the testing of perhaps 100% of the goods produced. Depending upon the product and the necessary tests, considerable product might need to be destroyed in testing. Of course, 100% can never be used for some articles, such as shotgun shells.

At the other end of the scale we have the situation in which there is no testing of the product either in process or after it is finished. In this case some defective product is sure to get into the hands of customers with consequent money loss for returned goods and the imponderable loss of goodwill.

Somewhere between these two extremes there is an optimum economic condition. This amount of testing will minimize the cost of testing plus the cost of returned goods plus the cost of lost goodwill. The first increment of money spent for test equipment and people to do the testing may be expected to bring a large return in savings. These savings will take the form of prevented spoilage in process, off-grade material caught before shipment, reduction of returned goods and maintenance of goodwill.

The next increment of money spent on test equipment and personnel will bring a smaller return from the same source. Sooner or later the point will be reached where the savings resulting from additional testing will be as small as or smaller than the cost of additional testing. This is the point where expenditures on test equipment and test personnel should be cut off.

The amount of test equipment and the number of people required may be estimated on this basis for each rubber product and will vary considerably with the type of product. For example, rubber toys might require very little testing as compared with a rubber tire, or garden hose relatively little compared to electrical insulation.

In general, the greater the number of critical properties specified by the customer or required by his type of service, the more money the manufacturer must spend on testing if he is to make certain of producing a satisfactory product. It is not possible to answer this question without striking a balance of the economic factors in some such manner, and of course there is no one answer applicable to all the varied types of rubber products.

Question—What can be done or is being done to standardize and calibrate test equipment throughout the rubber industry?

Answered by Mr. Scott: There is a Task Group under Mr. L. V. Cooper's Physical Testing Committee engaged in studying this particular problem. As yet, their findings have not been reported, but at least considerable progress is being made in this connection. Here again, as a manufacturer of test equipment, I would like to indicate that this is a matter of economics. We are attempting to establish a calibration service to the industry through solicitation and the traveling of a trained technician to the areas where apparatus of our manufacture is located. The procedure is meeting with some success, but it is expensive, and we find that many members of industry are not interested in making the expenditure for such service when it is offered. I believe other manufacturers of test equipment would concur with me in this finding.

Question—What is the spread in values for tensile and elongation that can be expected between laboratories when testing (1) slabs, (2) finished products?

Answered by Mr. Scott: Answering what spread in values of any test could be expected, necessitates the asking of another question for clarification, because what tolerance is desired, is really the question. By this I mean that if a tolerance of plus or minus 20% is permissible, the minimum of care both in preparing the specimen and in evaluating it, as well as the minimum number of tests, will probably permit control within the tolerance. However, if a tolerance of plus or minus 2 or 3% is desired, extreme care must be taken through-

out the testing procedure, and a greater number of tests must be made in order to evaluate that the material is within specifications.

In the testing of rubber, we have a number of processes through which the material must pass. To begin with, we have the pigments, the storage conditions of which have every influence upon their blending, the influence of their blending, the milling procedure, whether the nip is close and the bank high, the control of the temperature of the rolls during milling, the number of cuts that are made, the extent to which these cuts are made, and the time that the material is on the mill; next, the control of temperature upon the platens, the trueness of the parallelism between the platens of the press, the condition of the mold both as to parallelism of mold and cover plate, smoothness of cavity and cover plate, the bulk of the sample introduced into the cavity for molding, speed with which the platens bring the mold to a closure, how the sample is removed from the mold, how it is cured after removal, the temperatures under which it is cured, etc., the keenness of edge and stable dimensions of the die, the method of dieing even before we get to the tensile tester itself.

In this connection, we have proven that good housekeeping requires at least a yearly check on the tensile tester for calibration, compensation for wear, etc. The control of all these points must be stated before a spread in tensile and elongation values can be considered. There is an article in the literature which indicates that on a single compound, over a period of 4 months, that a tolerance of 5 percent on slabs could be maintained. The normal, however, for the Rubber Reserve laboratories in which optimum conditions of control were maintained both as to equipment, personnel instruction, and standardization of procedure, a tolerance of 15 percent on tensile and elongation was about as good as they could reach. Again, this was on laboratory prepared slabs.

As far as the tolerance that can be expected on finished products is concerned, again, one would have to know more about the type of product involved, because of the variations of sample preparation procedure that would be experienced.

Question—From the buyer's standpoint, are humidity corrections extremely important in fabric tensile tests? Does change in humidity have more effect on warp than on fill?

Answered by Dr. Dillon: In respect to the first part of this question, let us assume that the "buyer" referred to is the purchaser of the fabric to be manufactured into some product, i.e., he is not the ultimate consumer. Ordinarily, fabrics of hydrophilic fibers such as cotton, viscose rayon and wool are tested in a controlled atmosphere of 65 percent R.H. and 70° F., after bringing them to moisture equilibrium from the dry side; no correction is made to bring the results to a standard regain basis, as is customarily done with yarns and cords.

If the fabric is purchased on a weight basis, as is usually true for tire fabric, it is highly important for the buyer to know how much water he is paying for and what the inherent tensile properties of the tire yarns are under both bone-dry and standard regain conditions. This is probably true also for nylon cord fabrics, even though the regain at 65 percent R.H. and 70° F. is only about 4 percent. Obviously, regain corrections become much less important for the extremely hydrophobic fibers such as Dacron.

In regard to the relative effects of humidity changes on the warp and filling of woven fabrics, there is no unique answer to this question. Humidity effects on the load-extension properties of fabrics result not only from changes in the tensile properties of the constituent fibers, but also from changes in yarn configuration due to diametrical swelling. Hence, variation in fabric weave, twist and size of warp and filling yarns, weaving tension, etc., will determine the relative effects of humidity changes in the warp and fill directions.

Question—What is the reproducibility of tensile figures at 212° F., 250° F., and 275° F., as compared with 70° F.?

Answered by Dr. Liska: Based on the extremely limited amount of data available, it appears that the reproducibility of tensile figures (expressed in percent) is virtually independent of test temperatures over the range of 70° F. to 275° F. for four common elastomers, natural rubber, LTP, neoprene and butyl. This may not be true of compounds based on other elastomers, but there simply are not enough data available from which any further, positive conclusions can be reached.

Question—Have any improvements been made in the design of grips for the stress-strain testing of pure gum rubber vulcanizates? The present ones cause a tearing action to develop during the test with erratic tensile strengths resulting.

Answered by Mr. Scott: The best answer I can give to this is, if the original equipment supplied by the manufacturer is not satisfactory, that most manufacturers will be interested in hearing about it directly. In this particular connection, we have at least 8 different types of grips for rubber dumbbell test pieces, one or two of which seem to meet the general requirements and therefore are suggested by us when quoting on an instrument.

However, if such shortcomings in the equipment supplied were pointed out to the manufacturers, it is possible that similar complaints have been received and the situation improved through subsequent developments. To be sure, a special purpose clamp frequently is not as convenient or as quick in its operation, but if it is more satisfactory for a special purpose, its use is desirable. A direct answer to this question would be for the party who asked this question to solicit the cooperation of the manufacturer of the instrument he is using.

Question—What accelerated weathering tests on rubber are the most reliable indication of performance in service? What degree of correlation can be expected?

Answered by Dr. Blake: Temperature and sunlight and air contaminants such as moisture, oxygen, and ozone influence the deterioration of elastomers on outdoor exposure. Ozone is perhaps the most important of these. Our laboratories seem to find good relative correlation between the estimated service life and results from the "Ozone Weatherometer." The initial work in this correlation study was based on the use of the well-known Crabtree and Kemp apparatus. The test is reproducible and accurate for comparing the relative resistance of samples to ozone degradation. The test does arrange a series of samples in an order which parallels their deterioration under a given set of weathering conditions.

There seems to be no real accuracy as yet in estimating the actual service life of a compound by the test since,

obviously, no two service conditions are the same. Instruments which accelerate aging of elastomers by exposing them to cycles of light, humidity, ozone and temperature do not seem to give as good a correlation between this type of testing and outdoor weathering.

Answered by Mr. Doner: The Geer Oven and Oxygen Bomb tests are the most commonly used accelerated aging tests. We know that these two tests provide valuable information regarding the aging properties of a rubber compound, but they do not simulate all of the conditions found in natural aging. In recent years much work has been done on ozone testing using 25 and 50 parts of ozone per hundred million parts of air in temperature controlled test chambers. The results apparently closely approximate those obtained by long time natural aging, and round robin tests conducted in several laboratories yielded good correlation. A.S.T.M. D-1149-55T describes the method, but it is strictly tentative at this time.

Question—What is the present status of ozone testing —dynamic and static?

Answered by Mr. Keen: The A.S.T.M. Subcommittee coping with the problem of ozone testing has arrived at the fact that the lack of correlation from laboratory is due largely to insufficient rate of flow of the ozonized atmosphere into the test chamber, and insufficient agitation within the chamber. A unit designed to overcome these short-comings is currently being made. It is understood that a round-robin test is now in progress to determine how these new units correlate from laboratory to laboratory.

There are at least seven different devices being used for dynamic tests in an ozone chamber. In general, these devices are designed to operate on a cycle of flex, rest, flex, in order to approach service conditions. One of these units is unique in that it is air operated and produces a two-dimensional strain on the test specimen, prepared from a standard 6 x 6 x 0.075-inch slab.

One of the flexers that has been put in an ozone chamber is identical with a unit that is used outdoors to study the effects of atmospheric conditions on vulcanizates being flexed slowly. It will be interesting to learn whether or not some correlation between these two units can be established.

Question—Are there any good viscometers on the market which will measure viscosity at various rates of shear and temperature? If not, why is this type of testing device so difficult to design?

Answered by Mr. Scott: I would prefer to answer the second question first. It is not difficult to design an instrument, but it is extremely difficult to find a market the sales to which will compensate you for the work involved in producing an instrument which you might design. Speaking for the Mooney Viscometer, the Model NBS was established at one rate of shear and with temperature variations commensurable with the needs of the industry at the time it was designed.

Recently, developments within the industry have indicated a decided demand for increased test temperatures, and to some degree, a variation in shear rates. Our new Model STI Mooney Viscometer incorporates the ability to produce elevated temperatures with excellent control and further permits the variation of temperatures for the evaluation of the samples. We have given some thought to a variation in the shear rate. To date, however, we have been unable to consolidate sufficient information from the industry that will permit us to give any serious consideration as to what rates of speed are desired. This feature, however, has been considered in the design of the new Model STI, and as soon as we can find out what is desired, we anticipate developments in that direction. There are other viscometers offered to industries in general that incorporate variations in speed, as well as temperature. They are not, however, suitable for the evaluation of elastomeric materials.

Question—Can Williams Plastometer readings be correlated to factory processing and how is Mooney Viscosity being used as a batch by batch control of processibility?

Answered by Dr. Blake: The three more widely used plasticity tests, Firestone, Mooney, and Williams, do not predict accurately the performance of *new* compounds in factory processing. In compound development such tests are valuable in the preliminary adjusting of rubber compounds after which they must be modified by actual factory trials. For *accepted* factory compounds, all these plasticity methods serve as a useful control. Any major change in plasticity reflects a change in the compound which might effect processing. Such changes would not necessarily be indicated by other tests, such as physicals on cured slabs.

Since all of the plasticity tests give values which do not compare entirely with factory results, the selection of the type of test used is dictated partly by its convenience and the speed of testing. We use the Firestone plasticity for production control. Being an extrusion method, it gives fairly close correlation with actual factory extrusion conditions. Because the test is made with a positive displacement under controlled pressure sometimes it gives no indication of the action of the stock in the barrel of the factory extruder. The Firestone Plastometer is simple and versatile and the conditions of the test can be varied widely to accommodate compounds of an extreme range of plasticities.

The Mooney viscosity test is probably more widely used than either the Firestone or Williams. In this test the plasticity or viscosity is evaluated by a shearing action caused by motion of a rotor in the center of the test piece. From a standpoint of production control it is a good test since satisfactory control readings can be taken from 1½ to 4 minutes after the machine is started. Sample preparation is simple, but the acquisition of results requires more attention on the part of the operator than does the Firestone test. Readings must be taken while the machine is running and at specified times. The Mooney apparatus is less versatile than the Firestone in that fewer adjustments can be made to the machine to extend its range. It does give values usable for control work on all normally used compounds. It can be used conveniently to indicate scorchiness in compounds.

The Williams test has to a large extent been supplanted by the Mooney test, but the Williams test is valuable for the measurement of nerve.

All three tests measure somewhat different properties in the uncured stock so that data from one test cannot be converted readily to one of the others. This often leaves the choice of test to personal preference based on operating convenience rather than on factual information obtained from it. For convenience of operation either the Firestone or the Mooney is preferred since neither requires an accurately sized sample. Wil-

liams nerve values are important in extruding shapes to close tolerances. It is also useful for embossed calendering.

Answered by Mr. Keen: Williams' plasticity and recovery readings can be and have been correlated to factory processing. The plasticity number is a good indication of the flowability of the material which may be related to extruding, calendering, or molding. The recovery figure is a good indication of how the material will change in dimensions upon extrusion or calendering. Although in general, the Mooney Viscometer has replaced the Williams Plastometer, the latter instrument is still being used as a factory control test in the processing of cements.

A Mooney viscosity curve obtained at a scorch temperature is very useful as a batch to batch control of processibility. Processibility is used here in the full sense of the word; that is, as related to extruding, calendering, or flow during molding. The viscosity during the first two to three minutes reflects the viscosity of the raw polymer and gives some indication of how well the compound has been mixed. The time to incipient vulcanization indicates whether or not all the curing agents have been added. The most popular scorch temperature for natural rubber is about 275° F. and 300° F. for GR-S.

Question—Discuss single strand static adhesion test for bead wire.

Answered by Mr. Cooper: Two of the properties required of bead wire are (a) some adhesion when built into the tire and (b) resistance to rusting in the storage. Materials used to inhibit rusting often cover up the coating on the wire which gives the required adhesion —hence the laboratory adhesion tests on incoming shipments.

Question—Compare the better methods for evaluating the degree of pigment dispersion in a rubber compound.

Answered by Dr. Blake: Proper dispersion of pigments in rubber is important from many standpoints and it is a complicated problem. Physical and electrical properties and processing characteristics are dependent upon adequate dispersion. Theoretically, the evaluation of the dispersion should take into account the properties desired most in the final product by the pigment addition. One method is the measurement or estimation of reflected light from a freshly cut rubber surface. Poorly dispersed particles in the surface scatter the incident light and reduce the intensity of the reflected light.

If physical properties are used as a measure of the effect of different mixing methods, one must use a number of samples to compensate for normal variations. Valuable physical tests are tensile and tear. Even these can be misleading unless care is taken to interpret results in the light of what is desired from a service standpoint. Physical tests, in general, are not sensitive enough to measure differences in dispersion beyond a certain degree of homogeneity.

It has been shown for instance that by using a laboratory Banbury mixer to incorporate carbon black in GR-S no improvement in physical properties was obtained after about 4 minutes mixing but that the electrical resistance continued to rise up to 8 minutes or more. This rise in electrical resistance shows that the carbon black aggregates were still being broken up. The measurement of electrical resistance in carbon black stocks is a sensitive measurement of dispersion.

Another method is to measure transmitted light through extremely dilute solution (0.1 per cent or less) of rubber mixture in solvents. The method depends upon the pigment particles being small enough to remain suspended in the solvent. Poorly dispersed aggregates which are too large to remain suspended settle to the bottom and will not affect light transmission.

All of these methods serve particular purposes. In general nothing can take the place of the microscope in determining the quality of a dispersion. It is relatively simple to view a freshly cut surface under the microscope and count or estimate the number of undispersed particles and to compare the results with those on a dispersion known to be satisfactory.

Question—When lab testing tread compounds, what are the most reliable methods for (a) crack initiation, and (b) cut growth?

Answered by Dr. Liska: Although a great deal of effort has been spent on the development of a laboratory tread cracking test for both crack initiation and cut growth, some form of one of the earliest ones developed, the DeMattia test, appears to be both the most widely used and the most reliable. Other types, such as the Firestone Groove Cracking Machine and modifications of a molded-groove belt test are also used in various laboratories with varying degrees of reliability, but none seems to be as widely accepted as the basic DeMattia method.

Question—Discuss the merits of various raw tire fabric fatigue testing methods.

Answered by Dr. Liska: Although a great deal of effort has been expended over a number of years in an attempt to develop raw tire-cord fatigue test methods, none has proven to be a very useful method of predicting fatigue performance of a cord in a tire. These tests are, however, of limited use to a cord manufacturer or supplier, providing him with a process control method and also means of establishing "ball park" fatigue resistance figures. For example almost any of the raw cord tests, such as the U. S. Rubber Company test or the DB (dynamically balanced) test, it is believed, would enable a manufacturer to determine whether a tire cord made from some new material has very poor fatigue resistance (which would immediately remove it from further consideration) or whether its fatigue resistance is of the same order of performance as rayon, for instance. Such a preliminary evaluation would be particularly useful if the material presented some unusual adhesion problems which would require considerable experimentation before a "cured-in" fatigue test could even be considered. At least one of the large producers of rayon yarn has found the DB test to be a very sensitive process control test.

One explanation for the failure of a raw cord test to correlate with service flexing is based on the generally accepted theory of flex fatigue failure, which postulates that linear compression of the cord during part of the stress cycle is necessary to duplicate fatigue failure in tires. If this theory is accepted, the failure of raw tire cord tests to correlate with service flex fatigue is not difficult to understand, since none of these tests apply any significant amount of compression to the cord during the stress cycle.

Question—Discuss laboratory tests for evaluating "flat spotting" of nylon tires.

Answered by Dr. Dillon: There seems to be no established laboratory test for evaluating "flat spotting", although I'm sure that each manufacturer employs one or more tests to predict its magnitude. In this state of ignorance, it might be amusing to speculate a little on the nature of "flat spotting" and perhaps thus to draw some facts from someone who is actually working with it.

"Flat spotting" probably results from "primary creep", i.e., reversible flow, of the nylon cords as they are held for considerable periods under abnormal stress in the contact region of the tire. This assumption is supported by the fact that "flat spotting" is reduced by "hot stretching" which essentially eliminates the low modulus stress-strain region of the nylon fibers where primary creep can take place under very low stresses. It is also consistent with the experience that the effects of "flat spotting" disappear after a short distance of driving. Driving the car a short distance would serve to "cycle" the nylon cords and probably also produce a slight temperature rise; both effects would tend to reverse the primary creep deformation and bring the tire back into balance.

On the basis of this perhaps over-simplified analysis, it appears that an appropriate laboratory method of evaluating "flat spotting" would be a simple creep test with the dipped, hot-stretched nylon cords held at a constant tension comparable with that causing the flow in the contact region of the tire. The rate and extent of "primary creep" observed should be a measure of the degree of "flat spotting" and observation of the rate of reversed creep upon removal of tension should indicate the rapidity with which flat spots will disappear after starting the vehicle. This is only a theory, of course, and I should be happy to stand corrected by people who are actually working with nylon tires.

Question—What are the most significant low temperature tests and how do they relate to the various low temperature services?

Answered by Mr. Doner: The following low temperature tests are used: Brittleness by impact, Brittleness by fast bend, Torsional bend, Low temperature retraction, Young's Modulus in flexure and Low temperature compression set. All of these tests provide information as to how a given compound will perform at low temperature, and are valuable tools for the research compounder. But, from a practical point of view the cold test should be conducted on the finished part because the shape and bulk of a part determines the stress which must be taken by the compound. For instance, I have seen hose fail miserably when flexed at —65°F. and made from compounds that passed all laboratory low temperature tests.

Question—What is the best method of measuring the melting point or softening range of plastics such as polyethylene?

Answered by Dr. Blake: There are a number of possible methods of determining the softening range or melting point of polyethylene and similar plastics. The most widely used is the Vicat test. In this test the penetration of a one square millimeter needle under a 2 kilogram load is measured, while the sample is heated, so that the temperature increases at 50°C. per hour. The plot of penetration versus temperature gives a clear indication of the softening point. This is probably the best test.

Another simple method of determining the softening point is to plot curves of hardness versus temperature using a jig mounted Shore hardness tester. The sample, jig and tester must be preheated in an oven at each temperature for about one hour before the sample is tested. A one minute reading of hardness may be used. Other tests which may be useful in evaluating plastics for particular types of applications include a compression creep test or the torsional stiffness test which are covered by A.S.T.M. specifications.

Question—What testing equipment is available and recommended for evaluating resilient urethane foams?

Answered by Mr. Keen: The Flexible Urethane Foam Test Methods Subcommittee of the SPI Cellular Plastics Division has issued Proposed Tentative Specifications and Methods of Test for Flexible Urethane Foam. These methods include: (1) Indentation Load Deflection; (2) Compression Load Deflection; (3) Compression Set—(a) Constant Deflection, and (b) Constant Load; (4) Constant Deflection Flexing; (5) Tear Resistance; (6) Density Determination; (7) Flammability; (8) Tensile Strength, and (9) Humidity Aging.

For some applications it has been found desirable to measure resilience in addition to conducting this series of tests. Resilience may be determined with a modified Yerzley Oscillograph. From these tests it will be noted that conventional equipment for evaluating foam rubber can be used to evaluate resilient urethane foam.

Question—What kind of reproducibility should be expected in the usual physical tests (stress-strain, Mooney, etc.) in: (a) plant control test laboratories, (b) experimental test laboratories?

Answered by Mr. Scott: In answering a previous question, I believe I have covered stress-strain data both for plant control and experimental tests. As far as the spread of Mooney values is concerned, we feel that if proper care is given in the milling and preparing of the specimen, that a tolerance of plus or minus .5 Mooney points on viscosity and plus or minus .5 to 1 minute on scorch would be expected. Any variation in sample preparation would, of course, widen these tolerances.

Question—Discuss methods of evaluating staining and discoloration.

Answered by Mr. Keen: A.S.T.M. D-925-55 outlines methods providing standard conditions for producing and evaluating both contact and migration stains which may occur when vulcanized rubber is in contact with organic finishes under conditions of heat, pressure, or sunlight. Contact stains occur on the area in contact with the rubber and migration stains occur on the adjacent finish. Briefly, the test for contact staining consists of placing a rubber specimen between two metal plates having the desired organic finish and subjecting the sandwich to a specific weight at a temperature of 175 ± 2° F. for a specified time. The test for migration stain consists of placing the rubber specimen on metal having the desired organic finish and exposing this assembly to a specified light source for a specified time.

A.S.T.M. D-1148-55 outlines the standard method of test for discoloration due to sunlight and heat of

white or light-colored vulcanized rubber or vulcanized rubber covered with an organic finish. This test consists of exposing the specimen to a specified light source for a specified time. These methods are used extensively in the industry.

A slight modification of these procedures is used in the development of compounds for white sidewall tires and similar decorative rubber veneers on such products as washing machine and garden hose. In these cases the specimen is the decorative veneer vulcanized in contact with the substrate.

Question—What are the advantages of measuring the load-strain properties of a fabric in the warp and fill directions simultaneously?

Answered by Dr. Dillon: The theory upon which this so-called bi-axial fabric testing is based is simply that most fabrics have to bear loads in warp and fill directions at the same time. Thus, the simultaneously stressed warp and fill yarns interact in a complex manner which is not reproduced by conventional uni-axial tensile tests. Several years ago at Textile Research Institute we developed a simple attachment for a conventional strain-gage tester which provides the same rate of jaw separation in warp and fill directions. Load and fabric strain in the central uniformly stressed region are measured only in the vertical direction but, by mounting half of the fabric samples with warp vertical and half with warp horizontal, the bi-axial load-strain picture is obtained. Representative bi-axial data for a square-woven cotton fabric, tested at 65% R.H. and 70° F., are shown in Figure 1.

As would be expected, the "uncrimping" region characteristic of uni-axial tests is not present with the bi-axial tests for which the warp and fill load-strain curves rise steeply from the origin. Obviously, this fabric would be considered very well balanced, according to the uni-axial test. This does not prove to be the case, however, when the more realistic bi-axial test results are considered. Tests with the same fabric which had been wet-out with distilled water and dried are shown in Figure 2. Here the fabric appears unbalanced in both uni-axial and bi-axial tests.

A more elaborate bi-axial testing device has recently been developed by Fabric Research Laboratories of Boston, Massachusetts. With this device the rate of loading rather than the rate of jaw separation is controlled in warp and fill directions and very interesting results have been obtained which could never have been predicted from conventional uni-axial tests. In general, then, bi-axial testing is highly informative, but it must be admitted that all methods thus reported are rather fussy and would be difficult to use in routing testing.

Question—What is the latest thinking on the sensitivity and reproducibility level of the various "tear tests" for rubber and plastics as they relate to actual performance of such materials?

Answered by Dr. Liska: From the viewpoint of a laboratory test, with no reference to actual prediction of probable finished product performance, the sensitivity and reproducibility of the several tear tests more or less generally used in the rubber and plastics industry appear to be somewhat poorer (though not by a large amount) than those of the conventional tensile strength test. The degree to which the several tear tests can be related to actual performance varies widely and in most cases is probably quite low.

As a matter of fact the sensitivity and reproducibility of any given tear test are closely related to actual performance only in those isolated instances where the service conditions happen to subject the product to the same type, rate and extent of deformation which are characteristic of the test procedure itself. Some very recent work has been carried out relating tear resistance and modulus to abrasion resistance. More data are needed, however, before any definite statements can be made about this aspect of tear testing.

Question—Would an oven aging test, preceding a "cold" test, be more indicative of the true value of the compound to perform in actual service?

Answered by Mr. Doner: Yes. Because an oven aging test would drive out any low boiling or fugitive plasticizers which may have been used to improve the materials' low temperature properties. There are products that are never subjected to high temperatures in service, in such cases the use of an oven aging period prior to cold testing might disqualify a perfectly good product.

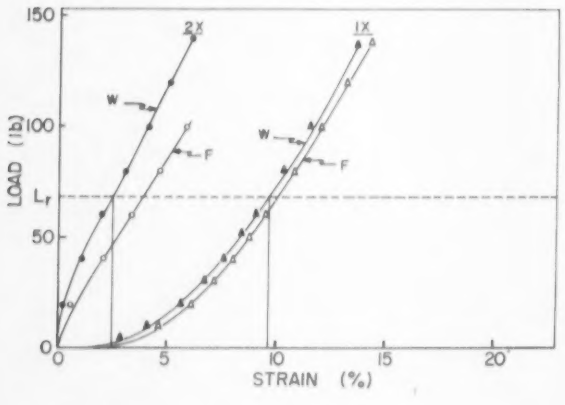


FIG. 1—Typical uni-axial (1X) and bi-axial (2X) load-strain tests for untreated cotton fabric. W—designates warp direction; F—designates filling direction.

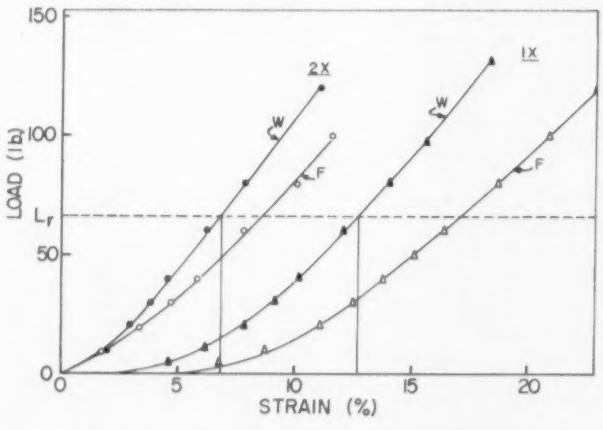


FIG. 2—Typical uni-axial (1X) and bi-axial (2X) load-strain tests for cotton fabric wet out with distilled water and dried. W—designates warp direction; F—designates filling direction.

Question—Explain the effect of different temperature levels when running compression set (like A.S.T.M.—Method B), and what are the most common temperatures used when running A.S.T.M.—Method B?

Answered by Mr. Doner: The compression set values for a given compound become poorer as the test temperature is increased. For example a natural rubber stock tested at 158, 212 and 300°F. could show 25%, 60% and 100% set respectively. Compression set tests are usually run at the following temperatures for the various rubbers:

Natural Rubber	158°F.
GR-S	158° and 212°F.
Neoprene	158°F.
Buna N	212° and 250°F.
Silicone	300° and 350°F.

Either 24 or 70 hour heating periods at 158, 212, 250 and increments of 50° F. above are generally used for compression-set tests.

Question—What is the best general "hysteresis" test for rubber and plastic compounds and combinations thereof, and what new equipment is available for such testing?

Answered by Mr. Keen: Hysteresis in the rubber industry is considered to be the per cent energy lost per cycle of deformation, or 100% minus the resilience percentage. Let us consider three methods of obtaining a measure of hysteresis:

(1) The area within the low-speed stress loop, expressed in energy units, is a measure of hysteresis. This loop is obtained by loading and unloading a specimen in tension, compression or shear, using a low rate of strain and large deformation. Since most practical applications involve vibratory stresses of relatively high frequency and low amplitude, this method of measuring hysteresis is not often used. In places where it is applicable, hysteresis in energy units can be obtained directly by use of an integrator such as the one supplied with the Instron Tester.

(2) % resilience may be obtained by use of the Yerzley Oscillograph. This method of determining hysteresis has greater utility since it involves low amplitude and relatively high speed deformation by comparison to the stress-strain loop.

(3) % resilience may also be obtained by instruments such as the Lord Dynamic Modulus tester which operates at low amplitudes and frequency range of from 1-60 cycles per second. The "best" method for evaluating a given composition depends on the application involved.

Question—What is a good test to evaluate the green tack of a rubber compound?

Answered by Mr. Cooper: Evaluation of adhesion to itself is most satisfactory. However, the technique in producing the union is the key to the reliability of the test. The test pieces should be subjected to closely controlled atmospheric and aging conditions similar to those encountered in production before assembly. In building or plying up the test sample contamination of any kind on the surface, including finger marks, must be avoided. Pressure should be applied by a roller operating under a dead weight load or a calibrated spring load. This is the most important part. After the test specimen has been prepared any one of several machines can be used to measure the force necessary to separate the plies.

Question—Are fabrics made of the newer synthetic fibers immune from attack by insect pests?

Answered by Dr. Dillon: In general, the newer synthetic fibers are not attacked by common insect pests such as the larvae of the clothes moth and the carpet beetle. However, if moth larvae happen to be imprisoned by a nylon fabric, they will eat their way through it to get to a delicious woolen sweater, i.e., the nylon is not digestible but neither is it impervious to insect attacks when it bars the way to a meal that is coated with a toothsome finish.

Question—What physical tests would you recommend for field service correlation with tire ride and squeal?

Answered by Mr. Cooper: Since tread design and tire construction are the important items on this problem, no laboratory test can be recommended.

Question—What is the value of a laboratory abrasion machine and what correlation can be expected with fleet tests?

Answered by Dr. Liska: This is probably one of the most controversial questions put to the panel. Although I believe my own views are expressed fairly well in the previous discussion, a few additional words of explanation may not be amiss. There has been considerable activity in this field recently and good correlations between laboratory abrasion tests and fleet results have been claimed. Inspection of the published results, however, shows that only a limited number of compounds has been tested in most cases and even these have generally been on limited types of compounds (i.e. limited to one or two base elastomers).

Even in those cases where correlations are shown, variations of plus or minus 20% are not unusual. Further tests, on a wider variety of compounds, would almost certainly increase this variation and reduce still further the reliability of any prediction based on laboratory test results. Perhaps improvements can be made on the present techniques which will significantly reduce the observed variations, but my own view is that this is not very probable.

Question—What laboratory dynamic test correlates best with high-speed (90 mph) tread cracking of synthetic treads?

Answered by Dr. Liska: This question would probably be answered differently by every technologist involved in this area of testing activities. As nearly as can be determined from a brief survey, the standard DeMattia test, or some modification of it, is being used with a fair degree of success in predicting high-speed tread cracking of synthetic tires. Not all laboratories are satisfied with the degree of correlation obtained with this test and several are still experimenting with some form of groove cracking test in which some attempt is made to simulate in the test sample all of the flexing features which the tread is subjected to under service conditions. None of these, however, is widely used and in most cases the extent of correlation has not been published.

Question—What is the industry evaluation of the "Zwick" hardness tester? Is it acceptable as a replacement for the Shore type?

Answered by Mr. Doner: The "Zwick" hardness tester is virtually a quadrant shaped type "A" durometer made in Germany. It is acceptable as a replacement for the Shore instrument.

Question—How is tensile, modulus and elongation related to dumbbell dimensions, test temperature and rate of elongation?

Answered by Mr. Scott: There is considerable information published primarily by one of the Armed Services and by a chemical company as to the effect of temperature upon these values. Basically it is safe to say that as temperature rises, the specimen gets softer, giving higher elongation values and lower tensiles. As the temperature goes down, the tensile strengths increase appreciably, but the elongation diminishes until, of course, we reach the brittle point where elongation is non-existent.

As far as the effect of speed upon the physical properties, this was fairly well covered in a paper of which I was co-author with Dr. D. S. Villars, which was given as part of a Symposium on Speed of Testing before the American Society for Testing Materials annual meeting in 1956. To briefly summarize, at a 30 seconds time to break, as the conventional tester allows, a tensile of 3900 p.s.i. and an elongation at break of 650% was observed, but at 28 milliseconds the same stock shows a tensile of 1900 and an elongation of 1300. Above that speed, however, there is a decided increase in tensile on GR-S, for instance by sevenfold over that of the standard test. In hard rubber, some work was done at Hood Rubber Company which shows that a 600% increase in speed added only 30% to the tensile and 80% to the elongation.

Question—How soon will elongation between bench marks be automatically recorded on charts in connection with tensile tests? Will there be more extensive use of automatically recorded or charted data?

Answered by Mr. Scott: I personally ran a Scott Tensile Tester in a well known rubber laboratory for 8 hours a day for 5 consecutive days, and at that time reached the conclusion that there must be some way this could be done automatically. To date, my findings can be summarized as follows:—Unless physical contact to the specimen can be permitted so that the spread between these contact points can be evaluated, there is no means available. Because vulcanizates under tension are susceptible to cutting, I do not believe that this should be tolerated.

For the past 6 years I have been actively engaged in talking, sketching, and otherwise coping with this problem with people in many pursuits. Unfortunately, to date we have nothing to offer. We do, however, feel that we are along the road to a conclusion. In answer to the second part of this question, automatically recorded or charted data is becoming more prevalent in many values, probably due to the expansion of facilities in personnel and the need for tabulated data suitable for transmission from the point of test to the desk of the evaluator.

From personal experience I can say that in 1948 we were shipping approximately 400,000 chart forms a year, where during the year 1956 we shipped over 1,350,000, and our recorder sales for the Mooney Viscometer increased by 500% within a similar period.

Question—What are the effects of nuclear radiations upon the physical properties of textile materials?

Answered by Dr. Dillon: This field of research is rather new, of course, but already some interesting results have emerged. In general, the effects of high energy radiations on fibrous polymers involve two principal reactions which probably take place simultaneously in varying relative degrees: crosslinking and chain scission. Where crosslinking is the dominant reaction, the melting point of the polymer rises, the breaking tenacity and modulus increase, and the extensibility decreases. Thus, the crosslinking results in a fiber of increased strength, but it may also cause serious embrittlement. The competing reaction of chain scission tends to reduce strength and there is no evidence that anything but damage occurs.

The information already published suggests certain definite correlations between the effects of irradiation and chemical structure. Long-chain hydrocarbon polymers and polymers with no side-chains other than phenyl groups are predominantly cross-linked; for example—polystyrene and polyethylene. Cellulose and polymers containing halogens are badly damaged by irradiation, indicating predominant chain-scission. Polyesters and polyamides appear to be intermediate in stability.

A recent paper by Teszler and Rutherford indicates that the degree of fiber orientation is also important in determining the effects of irradiation. Working with Dacron fibers with various draw-ratios, they showed that more cross-linking, as measured by elastic modulus, occurs at the lower draw-ratios, with both neutron and gamma irradiation. This result seems to be at variance with the concept that crosslinking is promoted by high orientation, i.e., increased average proximity of crosslinkable groups in the polymer chain.

Question—Outline the test methods used in determining curing rate of vulcanized foam rubber products. Outline tensile strength and elongation test methods for films made of compounded latex.

Answered by Mr. Keen: There are two methods currently being used and both are considered satisfactory. One method uses a doughnut-shaped specimen that is pulled on a testing machine immediately following the steam cure while the specimen is hot. The strength of the hot wet foam is used to indicate the state of cure. The other method uses a conically-shaped specimen which is given a steam cure, washed and then passed through a wringer roll set at a fixed opening. As would be expected, the undercured section of the specimen takes a permanent deformation and the distance from the apex of the cone to this point of deformation indicates the state of cure. If more accurate data are needed or if state of cure information is desired on the dry cure, then compression set test or an analysis to obtain the combined sulfur should be used.

A.S.T.M. does not have a procedure for either preparing or testing latex films. A.S.T.M. Committee D-11 Subcommittee VII and the S.A.E.-A.S.T.M. technical committee on Automotive Rubber Subsection IV-U are currently working on the problem of film preparation. It is believed that the industry follows the procedure in A.S.T.M. D-412 for determining stress-strain characteristics in tension of latex films, even

though these are excluded in the scope. Most laboratories use the Scott Tester Model L-5, having a capacity of 60 pounds, with the dynamometer head of the compensating type. More consistent results have been obtained in the testing of latex films by gaging the specimens more accurately and setting the compensating weight of the Scott Tester accordingly.

Question—What is the order of importance of the various electrical properties for general screening of plastics and rubbers for electrical applications?

Answered by Dr. Blake: The relative importance of the electrical properties in screening rubber and thermoplastic materials depends on the particular application. The properties which define an insulation for power cables are not necessarily those required for communication cables or for such electrical items as switchboard matting, building wire or electric blankets.

There are four principal electrical properties which characterize the usefulness of an insulation: (1) Dielectric strength. This is a measure of the ability of an insulation to withstand voltage. It is a function of dimensions, temperature, time of voltage application, kind of voltage (A-C, D-C, or impulse); (2) Electrical resistivity. This is a measure of the resistance offered by the insulation to the leakage of current through it. It varies with voltage stress and temperature; (3) Dielectric constant or specific inductive capacity. This quantity is the ratio of the capacitance of an insulation in a particular configuration to that of a capacitor identical in dimensions but using air as a dielectric. It is the ability of the dielectric to store an electric charge. It varies with temperature and frequency, and (4) Power factor. This property measures the proportion of the charging current in a capacitor or a cable which is dissipated in the form of heat, and therefore is lost. It is a function of frequency, temperature, and voltage stress.

All of these should be of a proper initial value and then should also remain stable under various operating conditions. Electric wires and cables, for example, are frequently immersed in water, exposed to chemicals, buried directly in soil, exposed to high temperatures and subjected to other environments which may deteriorate the insulation. In general the dielectric strength and resistivity should be high while the power factor and dielectric constant should remain low. It is not always possible to obtain the best values of all of these properties in any one compound. In many cases a compromise will be needed to give the material best suited technically and economically to the job at hand.

In the case of high voltage power cables, the initial dielectric strength should be high and should be well maintained throughout its service life. If the dielectric strength decreases below operating voltage the cable fails. In addition power cables require an insulation having a reasonably low dielectric constant and power factor so that hysteresis losses due in the insulation will not be excessive.

In communication cable or control cable dielectric strength is usually not a problem. The requirement of low transmission loss is important. For this reason, dielectric constant and power factor must be low initially and remain stable over long periods of time.

In addition to the electrical wire and cable there are many other applications of rubber and thermoplastics in which electrical properties are required. In molded terminals or bushings, for example, not only is dielectric strength and power factor important but resistance to tracking on the surface of the material is a critical factor.

Question—Is it possible to predict fabric performance from knowledge of the mechanical properties of the constituent fibers?

Answered by Dr. Dillon: Prior to Harold DeWitt Smith's historic Marburg Lecture in 1944, "Textile Fibers, An Engineering Approach to their Properties and Utilization," the answer which most textile technologists would have given to this question would have been an unqualified "no". Since that time many things have happened in fiber technology. Most of the important synthetic fibers were developed on the basis of qualitative concepts of fiber-fabric relationships. Now intensive work is being done to develop quantitative relationships.

The major stumbling block in solving this problem is the complex geometry of fibers in yarns and yarns in fabric. Significant progress has been made, particularly by Hamburger and his colleagues, of Fabric Research Laboratories, in this field, and other organizations realize that this is a key problem, not only for the producer of synthetic fibers, but also for the wool grower and the cotton breeder. All fibers, natural and synthetic, must eventually be supplied according to engineering specification for given end uses.

We cannot afford the time to discuss in detail this currently active field, but it might be interesting to examine a few cases where the geometry bugbear has been substantially eliminated. Let us first consider the case of three light fabrics of cotton, Fortisan, and viscose rayon which were tested under four different conditions, designated as follows:

O — original untreated
W — wet out in distilled water and dried
A — padded with pH 2.0 HCl solution and dried
F — padded with 7.5% HCHO solution at pH 2.0 and baked 30 min. at 110°C.

Yarns and single fibers were teased from both the warp and filling of these fabrics and tensile tests were made on single fibers, yarns, and fabrics at 65% R.H. and 70° F.. Only one of the various tensile properties measured, breaking strain, is shown in Figure 3. The vertical dimensions of the rectangles at each experimental point indicate the respective precision of the corresponding group of measurements.

There is a very heartening correlation among the breaking strain values of single fibers, yarns and fabrics under the four conditions of fabrics treatment. This correlation is most impressive with Fortisan where its greater stability upon swelling with water minimizes fabric-geometry changes in the O-W transition. Other tensile properties measured—breaking stress, elastic modulus, and toughness—all behave in about this same manner.

As a second case of fiber-fabric property correlation, let us examine the flex abrasion (Stoll Tester) of a wool-worsted fabric which was degraded with acid in various degrees. Wool fibers were teased from the fabric after each acid treatment and the tensile properties were measured wet. The graph of Figure 4 giving fabric abrasion cycles vs. fiber breaking energy is a beautiful illustration of the fact that single fiber properties do govern fabric performance, providing horsesense is properly applied. Unfortunately, the geometrical prob-

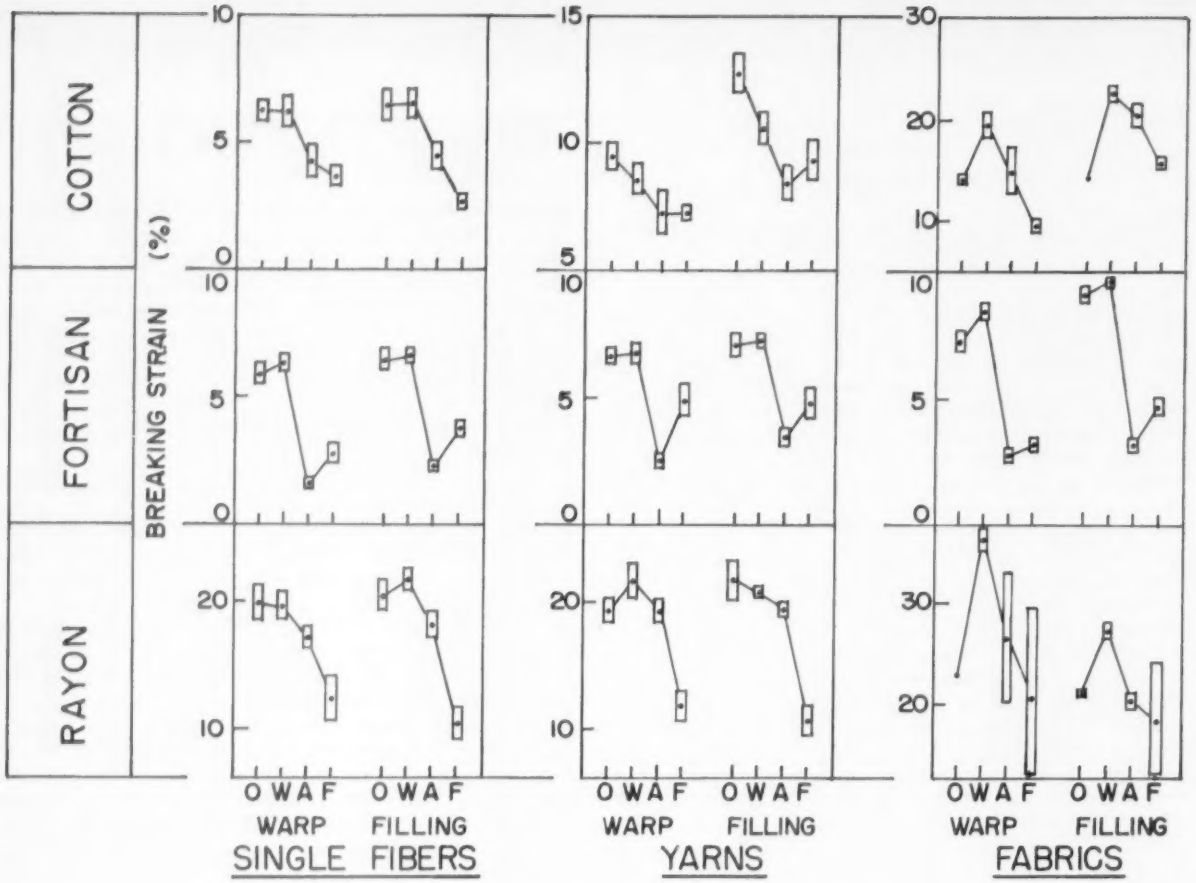


FIG. 3—Breaking strain versus treatment. O—designates original untreated; W—water-treated; A—acid-treated, and F—formaldehyde-treated.

lems which enter into the situation under practical conditions call for more than horsesense power, but we now have many able people working in this difficult field. Harold Smith's ultimate objective, engineering design of fabrics in terms of fiber properties, now seems to be approaching realization.

Question—Discuss the methods used for cold and hot, static and dynamic tests of rayon and nylon tire cord adhesion.

Answered by Dr. Liska: The simplest static cord adhesion test used is one in which several cords, spaced about 1/16-inch apart, are molded in or near the surface of a fabric reinforced pad and are then pulled out of the slab one at a time. The average force required to separate the individual cords from the rubber is used as a measure of the static adhesion. Another, somewhat similar method, is the strip pull-down test. In this test, cord fabric is cured into fairly sizeable pads, usually reinforced on both sides by square woven fabric. These are then cut into narrow strips parallel to the direction of the cord fabric. Again, the average force required to pull the strip apart at the cord fabric rubber interface is taken as a measure of the static adhesion force.

The method which is probably most widely used today for determining both hot and cold static adhesion of tire cord to rubber is the so-called "H" test. This method was originally described by Lyons, Nelson and Conrad, and has a number of advantages over most of the other tests used, not the least of which is the fact that a specific adhesive force can be calculated which is independent of the diameter of the test cord used. Also the force thus measured is less dependent on the tensile properties of the compound used to make up the test pads than is the case in other tests. Furthermore, the test is relatively easy to perform and special molds have been designed and built to facilitate and speed up the testing procedure.

A number of dynamic adhesion test methods have also been described in the literature. Most of these are basically similar to each other in principle. The test specimen is usually subject to some type of oscillating deflection designed to weaken or deteriorate the bond between the cured-in cords and the rubber, following which the adhesive force is measured. Comparison of this force with that obtained on an unflexed specimen is presumed to be a measure of the dynamic cord adhesion. New methods are currently being tried, but so far none has been widely adopted or generally accepted as yet.

Question—What physical tests will show adequate cement adhesion for tire tread splices and tread to carcass adhesion in field service?

Answered by Mr. Cooper: Field service is definitely spelled out in the question and field service infers elevated temperature. Therefore a machine for this test (I do not believe any are commercially available) must operate at elevated temperatures and subject the test sample to repeated separation pulls at stress less than the force necessary to produce complete separation on an initial pull. No standard physical test evaluates the desired property and other than actual road test there is no generally accepted evaluation.

Question—What physical tests will allow the development of tread compounds which will not "heat blow" in high speed airplane tires?

Answered by Dr. Liska: In general, three distinct types of tests are required. First of all, some test to determine the rate of heat generation of the tread compound is required in order to enable the compounder to select those compounds which produce the least heat. Secondly, some type of aging test is required to determine the rate of change of heat generation (and other features) with progressive oxidation. Finally, some kind of "thermal stability" test must be performed to establish the rates of degradation of the compounds in question resulting from heating alone, independent of oxidation as such.

Some of the "blow-out" tests currently in use combine all three of these aspects into a single, completely empirical test procedure. If such a test does not always predict probable product blow-out performance of the compounds involved, one should not be too surprised.

Question—In conveyor belting, is it possible to correlate fabric flexibility with belt flexibility to be able to predict troughability? What is the lowest degree of fabric flexibility or belt troughing which is acceptable in conveyor belting?

Answered by Mr. Doner: The flexibility of the fabric in a conveyor belt undoubtedly has some influence on the troughability of the belt, but there are several other factors such as number of plies, thickness of skims, hardness of cover and width of belt which must be considered when discussing troughability. To my knowledge no definite means of defining troughability has ever been devised.

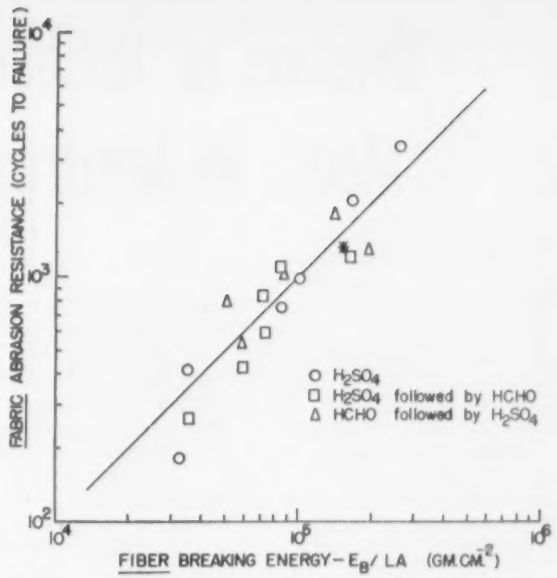


FIG. 4—Fabric flex abrasion versus single fiber energy to rupture.

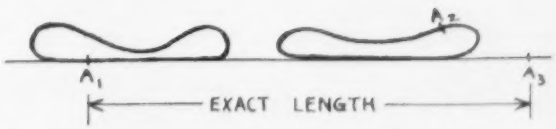
Question—Do high tensions in the dipping of rayon conveyor belting duck fabrics, with resulting low fabric elongation, materially affect the performance of a conveyor belt?

Answered by Mr. Doner: I would say that it would not materially affect a belt's performance. However, the trend seems to be to allow the rayon fabric to shrink during the dipping operation, and then remove the excess shrinkage during the curing of the belt.

How to Find Exact Length of an Endless Belt

CONTINUOUS rubber belts that have no end point from which to take a measurement have posed somewhat of a problem. Measuring around pulleys or sheaves with a steel tape, as usually directed, does not give the true belt length because the thickness of the belt is not included in such measurement. And likewise, measuring around the outside of the old belt with a steel tape is incorrect, because it includes the entire thickness. Measure around the pulleys, then around the belt, add the two, divide the sum by two, and you will have the correct length—for most belts of rectangular section. The correct length, always, is the length of the belt along its neutral axis.

The sketch herewith shows an infallible method for measuring the exact length of any endless belt. It is a good kink because it is so easy to perform, because it does not require a steel tape (any good straight edge, rule, or steel square will do), and it gives results that



are obviously accurate. Lay the belt on the floor toward the right, as though it were a caterpillar tractor, without permitting any slip between the belt and the floor. Presently the mark on the belt will be at A_2. As soon as the belt makes a compelte cycle the mark on the belt will touch the floor at A_3. Make a mark on the floor at A_3. The exact length of the belt is the distance between A_1 and A_3, which is easily measured without possibility of error. W.F.S.

Division of Rubber Chemistry, A. C. S., Meets in Montreal on May 15 to 17

THE 71st meeting of the Division of Rubber Chemistry of the American Chemical Society will be held jointly with the Rubber Division of the Chemical Institute of Canada at the Sheraton-Mount Royal Hotel, in Montreal, Canada, on May 15 to 17. During the three-day program, twenty-three technical papers on developments of current interest will be presented. Other business and entertainment functions include a luncheon-meeting of the 25-Year Club; a reception for all registrants by the City of Montreal in honor of the first meeting of a division of the American Chemical Society outside the United States; the Colwyn Medal Address; business meeting of the Division, and the divisional banquet, at which time the Cowyln Medal Award will be presented.

The technical program for the meeting has been divided into four sessions, each with a general theme. On Wednesday afternoon, May 15, the papers will be devoted to "Testing Procedures," and on Thursday morning, May 16, to "Carbon Black." The subject for Thursday afternoon is "Compounding and Processing," while the last session on Friday morning, May 17, will be devoted to "New Polymers."

Each of these session will be presided over by a different chairman. On Wednesday afternoon B. S. Garvey, Jr. (Sharples Chemicals), Division Chairman, will be in charge, while the chairmen for Thursday are O. R. Huggenberger (Dominion Rubber) in the morning, and J. D. D'Ianni (Goodyear) in the afternoon. Norman S. Grace (Dunlop Research Center) will preside at the Friday morning meeting.

The Colwyn Medal Address will be given by Dr. William B. Wiegand (Columbian Carbon) at 11:15 a.m. on Thursday, when he will speak on "Carbon Black." Presentation of the Colwyn Medal Award to Dr. Wiegand will be made at the divisional banquet on Thursday evening by Dr. G. S. Whitby, formerly director of rubber research at the University of Akron, and now Professor Emeritus of that institution. Dr. Whitby will precede the presentation with an address on "Wiegand, the Man," when he will describe Dr. Wiegand's contributions to the rubber industry.

The Colwyn Medal Award, instituted by the late Lord Colwyn, is given by the Institution of the Rubber Industry of England for conspicuous services of a scientific or technical character which have had an important bearing upon the industry. The presentation to Dr. Wiegand will mark the first time that the award has ever been made in the Western Hemisphere.

For the benefit of early arrivals, there will be an opportunity to register from 4 to 9 p.m. on Tuesday, May 14, on the 9th floor of the hotel. The organized activities of the conference will begin on Wednesday morning with the luncheon-meeting of the 25-Year Club, under the chairmanship of Mr. Grace. After the technical program in the afternoon, the evening will be devoted to the reception by the City of Montreal at the Chalet on top of Mount Royal. Bus service will be provided from the door of the hotel. On Thursday the business meeting of the ACS Rubber Division will be held at 10:50 a.m. The divisional banquet will take place in the evening, and will include a program of entertainment.

Activities for the ladies include a get-acquainted luncheon in the Brittany Room of the Sheraton-Mount Royal Hotel at 12 o'clock noon on Wednesday, followed by a tour of Montreal in the afternoon. On Thursday they will make a trip to the picturesque Laurentian Mountains, with lunch at the Mount Gabriel Club.

Mr. Huggenberger is serving as chairman of the Local Arrangements Committee with J. L. MacDonald (Dupont of Canada) acting as co-chairman and secretary. Other members are: *Banquet*, Q. R. Ball (Northern Electric); *Financial*, H. Hencher (H. L. Blachford); *Housing*, E. B. Bibby (Harrisons and Crosfield); *Ladies Program*, A. W. Bell (St. Lawrence Chemical); *Program and Meeting Room*, E. A. MacKenzie (Pirelli Cables); *Publicity*, A. B. Lewis (British Rubber); *Registration*, W. R. Blundell (Dominion Rubber), *Special Events*, W. Edward (Caledonia).

Abstracts of the technical papers which will be presented at the meeting follow.

Program of the joint meeting of the
DIVISION OF RUBBER CHEMISTRY
AMERICAN CHEMICAL SOCIETY
and the
RUBBER DIVISION
CHEMICAL INSTITUTE OF CANADA

Sheraton-Mount Royal Hotel,
Montreal, Quebec, Canada
May 15-17, 1957

Wednesday Morning—May 15

9:00 A.M.—Registration.
11:30 A.M.—25-Year Club Luncheon.

Wednesday Afternoon—May 15

2:00 P.M.—Introductory Remarks by B. S. Garvey, Jr. (Sharples Chemicals), Division Chairman.
2:10 P.M.—Technical Papers.

Wednesday Evening—May 15

6:00 P.M.—Reception by the City of Montreal.

Thursday Morning—May 16

9:00 A.M.—Technical Papers.
10:50 A.M.—Business Meeting.
11:15 A.M.—Colwyn Medal Address by Dr. William B. Wiegand (Columbian Carbon).

Thursday Afternoon—May 16

2:00 P.M.—Technical Papers.

Thursday Evening—May 16

7:00 P.M.—Divisional Banquet. Presentation of the Colwyn Medal Award by Dr. G. S. Whitby.

Friday Morning—May 17

9:00 A.M.—Technical Papers.

Wednesday Afternoon—May 15

Testing Procedures

B. S. Garvey, Jr., Presiding

2:00 P.M.—1—Introductory remarks.

2:10 P.M.—2—The Application of Near-Infrared Spectroscopy to the Analysis of Polymeric Materials. I. The Identification of Polymers and Polymer Mixtures. *M. J. Brock and George D. Louth (Chemical and Physical Research Laboratories, Firestone Tire & Rubber Co., Akron, Ohio). (Paper will be presented by Mr. Brock.)*

The development of the Beckman DK-2 spectrophotometer has made the near-infrared range more accessible to investigation. Previous researches have shown that the 750 to 3500 millimicron region is rich in absorption due to CH, NH, and OH stretching vibrations.

The near-infrared absorption characteristics of pyrolyzed polymers and polymer products show that near-infrared spectroscopy has utility in the identification of polymers and polymer mixtures. The method consists of using a gas burner to rapidly pyrolyze the sample in a side arm test tube, collecting the distillate, diluting with carbon tetrachloride, filtering and obtaining the absorption spectra from 1000 to 3200 millimicrons. The preparation of the distillate is reproducible. It removes the polymeric components from any non-volatile loading material present, and permits the rapid examination of vulcanized or cross-linked insoluble products as well as raw polymers. The polymers are identified by characteristic absorption maxima or by comparison with absorption curves of known materials.

A variety of elastomers and plastomers have been studied. Application to the identification of mixtures is exemplified by the detection of the presence of SBR (styrene-butadiene rubber) in vulcanized mixtures of SBR and natural rubber. This is possible because the aromatic CH absorption due to the styrene in SBR is characteristically different from the aliphatic CH absorptions of natural rubber.

2:30 P.M.—3—The Application of Near-Infrared Spectroscopy to the Analysis of Polymeric Materials. II. The Quantitative Absorptiometric Determination of Elastomers in Rubber Products. *K. E. Kress (General Laboratory, Firestone Tire & Rubber Co., Akron, Ohio).*

A Beckman DK-2 recording spectrophotometer is applied to quantitative absorptiometric analysis of elastomer pyrolyzates in the near-infrared spectral region from 2100 to 3200 mu. This versatile method has been proved to be rapid and reliable for analysis of the common general purpose elastomers when used alone or as mixtures.

About 200 to 300 mg. of the extracted rubber product is pyrolyzed over a gas flame and the distillate is retained in 3.0 ml. of perchloroethylene. Near-infrared absorbance is recorded in 1 cm. quartz cells.

Quantitative analysis of mixed natural and styrene-butadiene rubber (SBR), or natural and butyl rubber, is achieved in about 15 minutes by an absorbance ratio method with an accuracy comparable to that of the single purpose chromic acid method for determining natural rubber. Ready application to analysis of other elastomer mixtures and also to plastomers is evident.

This analysis is not affected by normal variation in styrene content of SBR, but use of an absorbance ratio at different wave lengths makes possible direct determination of the styrene present in the copolymer. The acrylonitrile content of nitrile rubbers may be determined in a similar manner. A direct absorptiometric analysis for percent total polymer as synthetic SBR or butyl replaces the present indirect analysis by difference.

2:50 P.M.—4—The Dunlop Rotary Resilience Machine. *D. Bulgin and G. D. Hubbard (Dunlop Research Center, Birmingham, England). (Paper will be presented by A. D. Dingle, Dunlop Research Center, Toronto, Ontario).*

A machine for measuring dynamic modulus and resilience, which has been found to be of particular value in the design of compounds for use in tires, is described. In principle, it consists of an annular solid sample on a suitable steel center which revolves under load on a drum driven at a constant speed. The sample can be cooled or heated so that the dynamic modulus, energy loss and resilience can be determined continuously from —80°C. to +200°C. The sample undergoes deflection similar to that of a tire, i.e., a cycle of deflection and relaxation followed by a comparatively long rest period between successive cycles. Two speeds equivalent to road speeds of about 30 and 120 m.p.h. can be used.

The relations of deflection to modulus and of the energy stored in the deflected sample to deflection and applied load have been calculated. The dynamic and static modulus and the resilience of the sample defined as energy returned/energy input per deflection cycle can be calculated. Experiment shows these calculations to be accurate within acceptable limits.

The machine enables routine laboratory measurements to be made of dynamic modulus, energy loss under standard load or standard deflection conditions and resilience as a continuous function with temperature. The time required for test from room temperature to 200°C. is approximately one hour.

3:20 P.M.—5—Temperature Effects on Elastomer Flow Patterns in the Mooney Viscometer. *David Craig, A. E. Juve, L. O. Schroyer, C. E. Sitz, R. A. Harrington and Ross Shearer (B. F. Goodrich Research Center, Brecksville, Ohio). (Paper will be presented by Dr. Craig).*

A straight-line relationship was expected between reciprocal absolute temperature and log of the Mooney viscosity for rubbers such as GR-I 18. The actual plots, however, in each case followed more than one line. The complicated nature of flow in the viscometer was revealed by studying specimens made up of alternate black and white layers. These specimens were sliced after running, and the type and extent of flow noted by visual inspection.

The nature of the flow can be understood to some extent by study of these specimens along with results reported by Mooney and Wolstenholme and also those by Fenson for differently constructed specimens. The increase in Mooney viscosity during measurement, which is found in some rubbers and which has been called the Y value by other investigators, results from "makeup" of the specimen following the slight breakdown during the initial period of running.

3:45 P.M.—6—An Electronically Instrumented Pendulum for Evaluating Impact Absorption of Foam Materials. *C. S. Wilkinson, Jr. (Research Division, Goodyear Tire and Rubber Co., Akron, Ohio).*

The impact pendulum, a familiar and convenient apparatus in rubber technology, has been adapted for use in the evaluation of foam materials for shock and vibration absorption applications, including crash pads of various types. Appropriate pendulum design and electronic instrumentation provide an advantageous system for measuring impact characteristics. In order to obtain the maximum information from the data it is necessary also to have an understanding of the physics involved.

The mechanical and electrical features of a machine suitable for making the necessary measurements are described. Mathematical formulas and computations required for designing the pendulum and analyzing the data are indicated. An explanation of the method of obtaining data is given, and a representative complete analysis of the results for a foam sample is presented as an example. Typical results from a few different kinds of foam are included as illustrations of the method and performance of the equipment.

Such characteristics as energy absorption, peak deceleration, duration of maximum deceleration, and rate of deceleration must be considered in the development of suitable foams. The machine described is a useful device in the laboratory evaluation of these properties.

4:10 P.M.—7—A Constant Torque Abrader with a Permanent Abrasive Surface. *Ira Williams (J. M. Huber Corp., Borger, Texas).*

The Grasselli DuPont abrader has been modified to provide variable speed and to operate at any predetermined constant rate of work. The round test disks are rotated flat against the

abrasive surface at the same r.p.m. as the abrasive disk. This assures a uniform rate of wear on the entire surface and provides an abrasive action in every direction. The test pieces and abrasive disk are enclosed in a cabinet which may be heated.

The abrasive surface is a metal disk with 30 mesh carborundum grit sparsely bonded with a modified epoxy resin. Such disks are easily duplicated within ± 2% and have maintained unchanged cutting power on tread stocks for six million revolutions. Such a disk becomes a standard for the measurement of abrasion. A constant talc feed effectively protects the abrasive from becoming smeared by any type of compound and the cutting rate remains unchanged regardless of the type of compound previously tested.

While the machine is capable of reproducing results within two or three per cent it will not predict the service life of a compound, though it appears to predict reliably the relative performance of compounds using the same basic matrix. It is useful in studying the effect of such factors as amounts and types of pigmentation or the effect of chemicals or temperature of operation or rate of slip within one basic matrix. No abrasion machine will compare compounds such as GR-S, oil-extended GR-S, or butyl rubber based on a widely different matrix, but may compare compounds based on such similar elastomers as natural and GR-S rubbers, provided the other substances in the matrix are the same.

Thursday Morning—May 16

Carbon Black

O. R. Huggenberger, Presiding

9:00 A.M.—8—Lignin as a Reinforcement for GR-S in Military Pattern Tires. ***Lloyd Krichew (Department of National Defense, Ottawa, Ont.), D. W. MacGregor (Howard Smith Paper Mills, Cornwall, Ont.) and T. R. Griffith (National Research Council, Ottawa, Ont.). (Paper will be presented by Mr. Krichew.)***

The Department of National Defense has a continuing interest in the existence and utilization of substitute materials to ensure wartime availability. Lignin's potential as a reinforcement for rubber compounds has been known for sometime. Published and unpublished data indicated that sulfate lignin might be a useful reinforcement material for high synthetic rubber content military pattern tires. A co-operative program involving Canadian industry and government agencies was initiated to determine the feasibility of using lignin in this application.

This paper reports the work done in producing a quantity of experimental 11.00 x 20, 12PR, non-directional cross-country military tires, having a GR-S-lignin tread, with the current carcass construction, using conventional processing equipment. It compares results of these tires with carbon black controls, when performance tested on the indoor endurance wheel and when road service tested in Texas, by the Three-T-Fleet Inc., under controlled conditions. Laboratory data show comparable results, with road service tests demonstrating improved tread wear performance and hysteresis properties. Results of highway, gravel and cross-country operation will be shown. The tread stock formulation, showing the lignin loading and the curing system used, will also be given.

9:25 A.M.—9—A Study of the Moisture Adsorption Properties of Carbon Blacks. ***Eli M. Dannenberg and Webster H. Opie, Jr. (Godfrey L. Cabot, Inc., Boston, Mass.). (Paper will be presented by Mr. Dannenberg.)***

The moisture adsorption properties of commercial carbon blacks are of direct practical interest in many product applications. In color pigment applications controlled moisture content is actually beneficial, helping to contribute to improved flow characteristics. The curing rates of rubber compounds can either be accelerated or reduced by the presence of moisture, depending upon the curing systems being used. Excessive moisture in carbon black loaded polyethylene stocks can give rise to bubbling during extrusion. From a more fundamental and scientific point of view, studies of the adsorption of polar water molecules on carbon black are useful in elucidating the varied nature of carbon black surfaces.

Moisture adsorption measurements at various relative humidities were made on a complete range of commercial rubber and ink grades of carbon blacks. A series of heat treated MPC blacks were also studied.

A number of conclusions can be made based on the data obtained. The rates of moisture adsorption for channel blacks are faster than for furnace blacks. Moisture adsorption in the lower humidity range is dependent more on volatile content than it is on specific surface area. In the high humidity range adsorption depends on surface area. Equilibrium moisture adsorption data at a low and at a high humidity can be used as an approximate method for determining both the volatile content and surface area of channel grade carbon blacks. At humidities greater than 90%, moisture adsorption is sharply affected by bulk density indicating the occurrence of interparticle capillary condensation.

The high temperature treatment of carbon black causes marked changes in moisture adsorption capacity, particularly in the temperature range where hydrogen evolution occurs. The ash content of furnace grade carbons is shown to have some influence on moisture adsorption in the high humidity range. At a humidity of 50%, where ash content has an insignificant effect, it is possible to show a good correlation between moisture adsorption and surface area for the furnace grade carbons.

It is shown that a masterbatch of carbon black and rubber will adsorb moisture at a very low rate in quantities related to the particle size and type of carbon black. The fact that the carbon black surface in rubber is still almost totally active in its ability to adsorb polar molecules has some interesting fundamental implications regarding the nature of the rubber-carbon black interface.

9:55 A.M.—10—Infrared Studies of the Chemical Constitution of Carbon Black Surfaces. ***Harvey M. Cole and Eli M. Dannenberg (Godfrey L. Cabot, Inc., Boston, Mass.). (Paper will be presented by Mr. Cole.)***

The applicability of infrared spectrographic methods for determining the chemical constitution of carbon black surfaces was investigated. The high selectivity of infrared absorption data for detecting organic functional groups appeared promising provided the usual experimental techniques could be modified to sufficiently reduce the interference of the intense background absorption of the carbon black substrate. This modification was successfully accomplished by the insertion of fine metallic screens into the reference beam of a double beam spectrophotometer resulting in an improved instrumental response to the selective absorptions of the carbon black surface complexes.

It was found that these techniques result in reasonably strong spectral bands when applied to the highly oxidized blacks, highly treated ozonized and nitric-acid blacks, while weaker, less useful spectra were found for the less rigorously treated blacks. The furnace grade carbon blacks investigated, Vulcans 3, 6, 9, SC, and Sterling SO, gave weak absorption bands of negligible informative value. Consequently, most of the work reported here involves blacks containing appreciable "volatile" or oxygen content.

The experimental approach followed was one of alternating chemical treatment and infrared examination. Many chemical reagents were employed including oxidizing and reducing agents, peroxides, and various chemical materials which are known to be reactive with specific organic functional groups.

Strong evidence was obtained for the presence of hydroxyl, carboxyl, aldehyde and/or ketone groups plus a small quantity of molecular carbon dioxide. Chelated carbonyl was indicated while little or no evidence was found for assuming the presence of quinone-like surface structures. Also, postulation of the occurrence of many of these functional groups on adjacent carbon atoms is entirely compatible with both the infrared data and the observed effects of chemical treatment.

It is suggested that study of the reactivity of these highly oxygenated blacks is of value not only with respect to the particular black studied but also may be indicative of an analogous behavior in the case of other less easily studied carbon blacks.

10:25 A.M.—11—Improving the Carbon-Rubber Bond. *H. A. Braendle (Columbian Carbon Co., New York, N. Y.).*

Colloidal carbon (or carbon black) is recognized as the most powerful industrial colloid. Rubber is an equally versatile colloid whether produced by nature in a tropical climate or made by man in a reaction kettle. The affinity of these two colloids for each other makes possible the speed, economy and safety of automotive transport.

The scientist in his laboratory and the compounder in his factory both recognize the need for optimum spacial distribution of carbon black in rubber. In the factory at least, the trend has been to apply more and more force to push the two together. Today, we have reached the point where it may well be that damage to both colloids may outweigh the advantage of dispersion attained by force alone. Research for new and better carbons indicates that today's mixing techniques fall short of utilizing the full potential reinforcement of the commercial carbons now in general use.

A new concept was needed—the proper timing of the union of these two colloids. Industry has used the shotgun-wedding approach. Our continuous black rubber process brings them together at an optimum time and in an optimum environment where their natural affinity can produce a stronger and more lasting bond. The evidence is markedly better road wear.

11:15 A.M.—12—Carbon Black. *(W. B. Wiegand, Columbian Carbon Co., New York, N. Y.). (Note: This is the Colwyn Medal Address).*

Thursday Afternoon—May 16

Compounding and Processing

J. D. D'Ianni, Presiding

2:00 P.M.—13—The Thermal Diffusivity of Butyl Rubber and Its Compounds. *Donald R. MacRae and R. L. Zapp (Enjay Laboratories, Linden, N. J.). (Paper will be presented by Mr. Zapp.)*

Thermal diffusivity is the rate at which a temperature gradient travels through a mass of material. It is related to thermal conductivity by the expression $K = W/pc$, where W is the coefficient of thermal conductivity, p is the density, and c the specific heat. The determination of coefficients was based on the work of Williamson and Adams. The actual experiments were variations of the method of Rehner using thermocouples imbedded in the center of spherical rubber specimens. The thermal diffusivity coefficient, K, varies linearly with temperature with K decreasing as temperature is raised. Therefore, for a mass of rubber which is being heated, the coefficient must be expressed at an average temperature.

For butyl rubber compounds the following generalization may be made:

1. The diffusivity coefficients for butyl range from 0.67×10^{-3} $cm^2/sec.$ for a gum vulcanizate to 2.31×10^{-3} $cm^2/sec.$ for 160 parts of an HMF black in 100 parts of polymer. These are given for an average temperature of 210°F.

2. Thermal diffusivity is not dependent upon the state of cure of the butyl vulcanizate. Coefficients are similar at a high and a low concentration of sulfur cross-links.

3. The higher the loading of carbon black the higher will be the diffusivity coefficient and the greater will be the temperature sensitivity. The contribution of carbon black is more dependent on volume loading than on carbon black type.

4. A ground whiting ($CaCO_3$) as a filler yields compounds with lower diffusivity coefficients on an equal volume basis. This may be a function of lower pigment polymer wetting.

The application of thermal diffusivity coefficients to the heating of large slabs is demonstrated.

2:30 P.M.—14—Details of the Half Life of Polymeric Free Radicals. *G. Goldfinger (University of Buffalo, Buffalo, N. Y.).*

A model is presented based on the experimental conditions prevailing during photopolymerization in a free falling stream [G. Goldfinger and C. Heffelfinger, *J. Polymer Science*, Vol. 13, p. 123 (1954)]. Applying some simplifying assumptions, it is possible to correlate quantities which are potentially measurable, such as yield of reaction and number and weight average molecular weights with the spread of times elapsing between subsequent addition steps. In other words, the average time elapsed can be refined to a time distribution curve.

In the model, the time elapsed between initiation and forcible termination is subdivided into time elements. During each of these it is assumed that exactly one of the following must occur: the growth of the free radical to one larger by one monomer unit, natural termination without any change of size, or nothing. The sum of the probabilities of these events, called respectively s, f, and i, is of course exactly 1. Considering forcible termination of all polyradicals still surviving after t time elements one can calculate size and weight distribution curves.

2:55 P.M.—15—The Dependence of Tack Strength on Molecular Properties. *W. G. Forbes and L. A. McLeod (Research and Development Division, Polymer Corporation Limited, Sarnia, Ont.). (Paper will be presented by Mr. McLeod.)*

A method has been developed for measurement of the tack strength of fresh, reproducibly smooth rubber surfaces. Using this method, the tack strength of natural rubber is shown to be independent of polymer purity, Mooney, intrinsic viscosity, gel content and molecular weight distribution. Variations have been observed in the tack strengths of synthetic elastomers and in the potential tack strength as represented by the green tensile strength. The ratio of these two properties (called "relative tack") is found to vary with the shear viscosity of the polymer and can be altered significantly by changes in catalyst system or polymerization temperature. The lower the value of "relative tack," the longer the contact time required to increase it towards its limiting value of 1.

Measurements of copolymers of butadiene and styrene prepared in the Alfin system and in emulsion, and of butyl polymers, butadiene-acrylonitrile copolymers and polyisoprene prepared in different ways, indicate the importance of shear viscosity in determining relative tack strength. These measurements also indicate that relative tack is influenced much more by polymer molecular weight and chain entanglements than by microstructure.

The bond strength between two different uncured polymers is shown to depend on the difference between their cohesive energy densities. Laboratory measurements have been made on industrially compounded samples and found to give ratings consistent with factory experience.

3:20 P.M.—16—Electrically Sorted Punched Cards for Polymer Compounding Data. *R. F. Neu (Enjay Laboratories, Linden, N. J.).*

Greatly increased research activity in the now competitive synthetic rubber industry is leading to the accumulation of great masses of useful information. A problem which must be faced at all levels of polymer research work—basic, applied, and technical service—is that of recording this information in such a manner that it maintains its value by being readily available for future reference.

This paper describes the compact, efficient, and flexible punched card technical data filing system now in use at the Enjay Laboratories. Suggestions for the organization of such a data processing system are presented along with recommendations for design of card forms and data report forms. The characteristics and attributes of a relatively new Electronic Statistical Machine are discussed. This machine seems ideally suited to the handling of this type of data. The flexibility of the system is indicated by specific examples of problems which have been dealt with by it—problems in file searching; rearrangement of large masses of data into a given order; frequency distribution and correlation analyses, and statistical calculations.

This data processing system is offered as one technique by which other polymer laboratories may profit in utilizing manpower to the fullest.

3:45 P.M.—17—The Coding of Rubber Properties into a Specification. *Glenn E. King (Yale Rubber Manufacturing Co., Sandusky, Mich.).*

A coding system has been developed that consists of a prefix letter, a Roman numeral to indicate the hardness test instrument, and a series of Arabic numbers to indicate the hardness, tensile and elongation. Basic test requirements are associated with the coding when a suffix is not used. A second level of test severity is specified when suffix letters are used. Suffix letters indicate a class of tests rather than an individual test. The classification of the tests are based on similar properties. Individual test methods are indicated by small letters in a subscript. Tensile, elongation and hardness changes associated with the test are indicated by a number in front of the method letter. Volume is indicated by a number following the letter in the subscript. The time and temperature variables are coded into a superscript. The system is unique in the method of application of subscripts and superscripts and in the method of coding the temperature. Problems of definition and control of a coding system are discussed.

4:10 P.M.—18—Resorcinol-Formaldehyde Latex Adhesive for Bonding Synthetic Tire Cords. *Myron I. Dietrick (Koppers Co., Inc., Pittsburgh, Penna.).*

The adhesion of tire cords to the adjacent rubber in the carcass of the tire has developed from a minor problem with the cotton reinforced tire of the '30s where high speed operation was minimal, to a major problem with the rayon and nylon reinforced tires, and the increasingly higher operating speeds of today. The resorcinol-formaldehyde-latex (RFL) adhesive has found wide usage for bonding rayon and nylon cords in the carcass of the tire; however, little work has been published concerning the dip composition as related to adhesion.

This paper deals with the study of formulation variables that affect the adhesion of resorcinol-formaldehyde-latex compositions used to bond rayon and nylon tire cords to natural rubber. The treating and testing methods are described. Variables studied include: in situ resinification as compared with preformed resin; the resorcinol or resorcinol resin concentration; the formaldehyde concentration; the pH as adjusted with sodium hydroxide and/or ammonium hydroxide; dip concentration and composition of the latex. These studies show that bonds approaching the strength of the rubber stock are obtainable with properly compounded RFL adhesives.

4:40 P.M.—19—Radiation Effects in Elastomeric Vulcanizates. *B. L. Johnson, H. E. Adams and Marie Barzan (Chemical & Physical Research Laboratories, Firestone Tire & Rubber Co., Akron, Ohio). (Paper will be presented by Mr. Johnson.)*

As the application of atomic energy to civilian and military purposes becomes more common, a knowledge of the effect of nuclear radiations on polymers becomes more important. Therefore, the effects of gamma radiation on the physical properties of tread type vulcanizates have been evaluated by standard test methods over a temperature range of from 73° to 500° F.

Natural rubber is indicated to be best for usage as a general purpose elastomer in compounds which are to be exposed to gamma radiation. This is especially true for products which must withstand flexure. Irradiated natural rubber vulcanizates containing carbon black are superior to the non-irradiated vulcanizates in tensile strength at 400° to 500° F. However, at lower test temperatures tensile strength is not equal to that of the non-irradiated vulcanizates. This phenomenon is believed to be due to a high level of radiation induced cross-linking which may reduce crystallinity at the lower test temperatures and, at the same time, be responsible for the improved strength at the higher temperatures.

These data indicate that the cross-linking of natural rubber compounds by nuclear radiation may prove of value in the development of heat resistant elastomeric products having good flexing characteristics.

Friday Morning—May 17

New Polymers

Norman S. Grace, Presiding

9:00 A.M.—20—Vulcanizable Saturated Acrylate Elastomers. *Fred Leonard, Joshua Nelson and George Brandes (Army Prosthetics Research Laboratory, Walter Reed Army Medical Center, Washington, D. C.). (Paper will be presented by Mr. Brandes.)*

In the course of an investigation of latex dispersed elastomers suitable for use in cosmetic gloves for amputees, terpolymers of butyl acrylate methylmethacrylate and methacrylamide have been studied.

The redox emulsion polymerization rates for the preparation of the terpolymers in the presence of sulfuric acid (pH 2.5) and sodium hydroxide (8.5-11.4) were approximately 11% per hour, whereas the rates in the presence of ammonium hydroxide (pH 10) were 30% per hour. An explanation for this apparent anomaly is given.

The terpolymers were vulcanizable with formaldehyde and the mechanism for the vulcanization reaction is elucidated. Stress-strain curves as a function of cross-linking were shown to be dependent upon rate of strain. At 20 inches per minute the stress-strain curves were relatively insensitive to cross-linking concentration, whereas at 0.2 inch per minute the stress-strain curves approached closer to the stress ordinate in a predictable manner as the concentration of cross-links was increased. Cyclic tensile fatigue data, swelling index, and solubility varied in a consistent manner with increasing cross-linking.

Post dipping cast films in methyl formcel, followed by heat curing, resulted in the enhancement of surface properties, such as solvent, stain and abrasion resistance. This treatment also resulted in increased resistance to cyclic tensile fatigue, and a shift of the stress-strain curves of the materials so treated toward the stress axis. Post treatment effects were greater on initially uncross-linked and lightly cross-linked films. Highly cross-linked rubbery films were relatively insensitive to this treatment.

9:25 A.M.—21—Cure of Polyurethane Elastomers with Peroxides. *E. E. Gruber and O. C. Keplinger (General Tire & Rubber Co., Akron, Ohio). (Paper will be presented by Mr. Keplinger.)*

The practice of curing polyurethane elastomers through reactions of residual isocyanate groups is attended by certain unfavorable processing characteristics which have been a deterrent to their commercialization. Scorch, short storage life, excessive toughness and complex molding cycles have heretofore been common experiences. Further, despite some unusual properties, polyurethanes cured with excess isocyanate have not shown good dynamic properties, notably in their lack of balance between flex-cracking and heat build-up. Their poor stability as measured by tensile creep is perhaps another reflection of the inadequacy of this curing system.

It has been found that when peroxides are used in place of excess isocyanate for curing the polyurethane, these major disadvantages can be overcome. Use of the peroxide cure permits ease of milling, scorch-free processing and stable storage of fully compounded stocks. The cured product exhibits a good balance of dynamic properties and stress stability is much improved.

The peroxide cure of polyurethanes has been studied over wide ranges of peroxide structures and pigmentation. Dicumyl peroxide seems to be the best choice for curing polyurethane gum, black loaded or pigmented stocks. Use of 2.5 to 3.0 parts of dicumyl peroxide appears to be optimum for polyethylene propylene adipate/0.97 methylene di(p-phenylene diisocyanate) polyurethane which can advantageously be loaded with 20 to 30 parts of MAF black.

9:50 A.M.—22—The Cross-Linking of Butadiene-Acrylate Elastomers by Bases. *W. Cooper and T. B. Bird (Dunlop Research Center, Birmingham, England). (Paper will be presented by R. T. Woodhams, Dunlop Research Center, Toronto, Canada.)*

It is well-known that high strength elastomers are obtained by cross-linking copolymers of butadiene containing free carboxylic acid groupings with metal oxides. Vulcanizates of high strength (tensile strength 4000-5500 lbs/sq. inch, elongation at break 450-700%, 300% modulus 1200-2000 lbs/sq. inch, tear strength up to 400 lbs/inch) have now been obtained from copolymers of butadiene and acrylic esters, since it has been found that the normally slow cures effected by alkaline earth hydroxides are greatly accelerated by glycols and other polyhydroxy compounds.

Copolymers of butadiene with methyl and ethyl acrylates have been mainly studied, the minimum proportions of acrylate for good vulcanizates being 20% and 25% respectively. Elastomers of butadiene, acrylate and acrylonitrile have also been studied. Partial or complete replacement of the alkyl acrylate by a small proportion (5 to 10%) of 2-cyanoethylacrylate gives elastomers which cure very rapidly using the glycol-calcium hydroxide system. These polymers are more easily made than those in which free acid groups are introduced into the polymer, and they are also free from the tendency to scorch during processing.

The most powerful curing effects are observed with those polyhydroxy compounds which are good solvents for the bases, but those in which they are but slightly soluble still produce an acceleration in the rate of cure. The effect of the glycols in transporting moisture into the polymer is not thought to be of great consequence, and there is no evidence that they form cross-links directly by a base-catalyzed ester interchange reaction.

10:15 A.M.—23—Control of Degradation in Oil-Extended Styrene-Butadiene Rubber. *R. J. Reynolds (Shell Development Co., Emeryville, Calif.).*

Extensive studies in the recent literature have shown that extending oils promote the oxidative degradation of raw styrene-butadiene rubber in the presence of transition metal ions. Degradation has been effectively retarded by use of low iron polymerization recipes for the base polymer. Unfortunately, methods found for stabilizing oil-masterbatch based on conventional iron-pyrophosphate recipes have generally been inadequate and dependent on rather costly additives.

The present work demonstrates that degradation of conventional iron-containing oil-masterbatch can be satisfactorily inhibited by small quantities of inexpensive magnesium compounds. The most efficient results were obtained by simply adding magnesium naphthenates or resinates to the extending oil prior to emulsification and co-coagulation of the latex-oil blend. Alternatively, magnesium sulfate could be added to the coagulating acid. Magnesium levels of 125 to 500 parts per million of oil-extended rubber generally imparted heat aging stability equivalent to that of the oil-free base polymer. Magnesium naphthenates or resinates caused a slight retardation of cure, but had little or no apparent effect either on processability or vulcanizate quality at optimum cure.

A free-radical chain mechanism is presented which reasonably accounts for the degradation of raw rubber caused by extending oils and iron salts. Magnesium compounds are postulated to interfere with this chain mechanism by blocking a homogeneous catalytic effect by iron.

10:40 A.M.—24—Recent Developments in the Application of Kel-F Elastomer. *Lester E. Robb, Francis J. Honn and David R. Wolf (M. W. Kellogg Co., Jersey City, N. J.). (Paper will be presented by Mr. Robb.)*

This paper reviews the work being conducted at the M. W. Kellogg Research Laboratory toward the development of improved curing systems, and easier processing compounds for Kel-F Elastomer. The properties of both gum and specific compounds which influence their application will be discussed including recommendations for compounding, fabricating and curing. Data concerning the development of a polyamine curative, HMDA-Carbamate, and its use with Kel-F Elastomer will be presented. The use of a high melting fluorocarbon wax, Kel-F 200 Wax, as a process aid in fabrication is a recent development which shows great promise. Some of the specialty applications in which fabricated parts of Kel-F Elastomer are meeting severe requirements will be discussed.

11:05 A.M.—25—Properties of Fluorocarbon Elastomer 214. *A. F. Wilson, C. B. Griffis and J. C. Montermoso (Quartermaster Research and Development Center, Natick, Mass.). (Paper will be presented by Mr. Montermoso.)*

Military interest has recently increased in elastomers suitable for use at extremely high temperatures. Applications in some cases require contact with fuels and lubricating fluids. The M. W. Kellogg Company and the Quartermaster Research and Development Command have developed a new rubber—Fluorocarbon Elastomer 214—a 70/30 copolymer of vinylidene fluoride and perfluoropropene, which shows promising resistance to heat exposure, both in air and in fuels and lubricants.

Stocks compounded with peroxide, amine, and amine salt curing systems have been made. For comparison purposes similarly cured compounds of Kel-F Elastomer 3700, a copolymer of chlorotrifluoroethylene and vinylidene fluoride, were used. The paper describes physical properties at 75°F., flexibility at low temperatures, and resistance to red fuming nitric acid. Volume swell values are given for a variety of liquid fuels and lubricants. The effects of heat aging in air and in the various chemical reagents are also given. Exposure times range from 5 to 70 hours and temperatures from 220° to 600°F.

How to Figure Angular and Vertical Flat Belt Drives

STATING that rules for figuring horsepower are always based on horizontal belts, not on vertical or sloping belts, a flat belt manufacturer inquires as to how much percentage—if any—one should deduct when the belt runs at a 45° angle. A pump drive is involved, but the firm's customer did not say what kind of liquid is pumped. The belt has to be run so tight that the metal fasteners continue to pull out. The manufacturer desires to know of any rule for inclined or vertical belts that shows how much to deduct from the regular horizontal horsepower tables. A sketch attached to the inquiry showed a drive sloping 45°, half way between horizontal and vertical. The answer to the question is as follows:

To find the capacity of a vertical or inclined drive whose angle with the horizontal is greater than 40°, subtract the angle of inclination from 140. The result is the percentage of capacity of the belt as compared with a horizontal belt of the same size. Thus, where the angle of inclination is 45°, as in the case in question, 140 minus 45 equals 95%, which is the capacity of the belt at 45 degrees. Or, to reply definitely to the question, deduct 5% on account of the 45° incline. It will be found on applying this rule to a vertical belt that 50% would be deducted. This 50% may look pretty steep, but for year in and year out service it is recommended for most drives. It is always well to play safe.

W.F.S.

A Comparison of Instruments Used to Determine

The Suitability of Elastomers for Low Temperature Service

Part I: Hardness

By M. HANOK, C. K. CHATTEN, J. Z. LICHTMAN

Material Laboratory, New York Naval Shipyard, Brooklyn 1, New York

and T. A. WERKENTHIN

Bureau of Ships, Navy Department, Washington, D. C.

FOR more than a decade the Bureau of Ships, Navy Department, has been concerned with the development of cold resistant elastomers and products made therefrom. As would be expected this development program posed the concomitant problem of selecting suitable instruments and specification tests for evaluating the effects of cold temperatures on these products. Accordingly, the Bureau of Ships requested the Material Laboratory, New York Naval Shipyard, to investigate many known instruments and procedures used in evaluating the serviceability of elastomer materials under these conditions.

At least 20 procedures for measuring the properties of hardness, brittleness, stiffness, resilience, recovery, creep and stress relaxation of elastomer materials at cold temperatures were being utilized at the beginning of this study in 1945. Since then, additional instruments and methods have been developed for this purpose and these were included in the program. The present paper summarizes the work of the Material Laboratory on the evaluation of hardness. Investigations of the remaining properties will be discussed in future articles.

Hardness

The hardness of an elastomer is generally defined as its relative resistance to indentation when subjected to a deforming load by an indentor of specified size and shape. An example of the practical significance of this property is encountered in the performance of a watertight door gasket in which the degree of indentation of the gasket by the door flange toe is determined by the hardness of the gasket, the size and shape of the indenting toe, and the force exerted by the door closure mechanism.

In this program, the following criteria were selected in determining the suitability of each of four spring-load and seven dead-weight hardness testing instruments for possible use in Navy testing procedures: (a) Temperature range of usefulness; (b) Ease of manipulation; (c) Reproducibility of test data; (d) Cost and availability of the instrument; (e) Similarity to service conditions being studied, and (f) Widespread application with different elastomer materials.

In addition it was desired to derive approximate conversion relationships between hardness values obtained with some of the instruments.

Test Conditions

The experimental conditions selected for the hardness testing program were based primarily upon low temperature service requirements for Naval combat units. Consideration was also given to first and second order transition effects of elastomeric end items within this temperature range. A low temperature limit of —35°F. was established in 1947 as an in-service requirement for elastomeric materials used aboard naval vessels. A second limit of —65°F., representing the minimum sustained ground and air temperature in arctic regions, was established in 1953 *(1)*. A specimen conditioning and testing temperature range between working room temperature (74° ± 2°F.) and —65°F. was therefore used in this program for most measurements. In some special instances, tests were made at a temperature of —80°F. in order to determine the effects of extreme low temperatures on the elastomer specimens and instruments.

Hardness tests were made after specimen conditioning periods of 30 minutes and one hour at the various temperatures of exposure in order to minimize crystallization effects. Hardness of the specimens, as affected by longer periods of exposure, was determined during

Note: This paper was presented in a condensed version before the meeting of the American Society for Testing Materials, at Atlantic City, N. J., June 17-22, 1956.

The opinions and assertions expressed are those of the authors and are not to be construed as official or as representing the views of the Department of the Navy or the Military Establishment at large.

specimen conditioning periods up to 96 hours at the respective temperatures.

All evaluations at temperatures below room temperature were performed in thermally regulated chambers *(2)* cooled with dry ice. Each of the hardness instruments used in the study was conditioned within one of these chambers for at least one hour before use. Room temperature tests were conducted in a constant temperature room maintained at 74° ± 2°F. and 50 ± 5% relative humidity.

The stocks selected for study, as shown in the accompanying Table I, included 58 conventional and special purpose compounds covering a broad range of polymer types and hardnesses. The special purpose compounds were formulated to provide good low temperature resistance.

Spring-Load Hardness Testing Instruments

For most spring-load instruments the reading obtained in testing an elastomer specimen is a function of the instrument's spring constant, the size and shape of the indentor, and the time of instrument contact. To a lesser extent it is also a function of the contact pressure exerted on the presser foot of the instrument. It is therefore expected that, when hand pressure is used to apply the durometer to a specimen, the hardness values obtained may vary significantly when determined by different operators or even when determinations are made by the same operator *(5)*. For this reason, most of the tests performed with the spring-load instruments were made using a standard load attached to the top of the instrument. Under this load a constant force of three pounds was applied to the surface of the specimen exclusive of the spring-load. Tests made in this manner, with or without an instrument stand, were designated as "Method A". Tests in which the respective instruments were applied to the specimens by hand pressure only were designated as "Method B".

British and American requirements *(5, 6)* for durometers specify a similar presser foot and a truncated conical indentor acting against the loading spring. The Shore Type A Durometer, Rex Gauge, and Rex Dial Gauge Hardness Tester comply with these standards. In contrast to these instruments, the Wallace Hardness Meter uses a 1/16-inch diameter hemispherical indentor.

Shore Durometer:—One of the important features of the Shore Type A Durometer as shown in this investigation was its continuous frost-free operation at temperatures ranging down to —65°F. *(7)*. Calibrations performed at 0° and —40°F. *(8)* showed that the requirements of both American and British standards *(5, 6)* were met over the operating range of the instrument and that the loading spring constant remained unchanged at low temperatures. Reproducibility of hardness values obtained with the Shore durometer was good at temperatures ranging from room temperature to —65°F. for a variety of elastomer stocks. However, a study *(10)* of nine Hevea stocks, shown by numbers 46 through 54 of Table I, showed that reproducibility was slightly better for soft materials than for the harder materials. The durometer scale itself could be read with an accuracy of ±1 point.

Standard Rex Gauge:—The scribed vernier scale and graduated pin of the Rex Gauge used by the Material Laboratory have remained legible even after several years of service. Also, this gauge has demonstrated continuous ease of operation at temperatures down to —80°F. *(9)*. Precision of the readings was not dependent upon the degree of hardness of the sample elastomer. However, a serious limitation is the diffi-

TABLE I—STOCKS USED IN THE LOW TEMPERATURE HARDNESS PROGRAM

Polymer Type	Test Code Number	Sample History
Hevea	1	All stocks were used within five years after receipt by the Material Laboratory. Stocks 1, 3, 5, 7, 9, and 11 are conventional formulations. Stocks numbered 2, 4, 6, 8, 10, and 12 were compounded by the supplier to provide good low temperature resistance, generally by the use of special plasticizers or by assuring a tight cure. Stocks 1-15 were supplied by the Rubber Laboratory, Mare Island Naval Shipyard *(3)*. Stock 16 was supplied by Connecticut Hard Rubber Company.
Hevea	2	
GR-S	3	
GR-S	4	
Paracril 26NS90	5	
Paracril 26NS90	6	
Neoprene	7	
Neoprene	8	
Butyl	9	
Butyl	10	
Thiokol FA	11	
Thiokol FA	12	
Neoprene	13	
GR-S	14	
Hevea	15	
Silicone	16	
Thiokol ST	17	The hardness of all stocks was determined within one year after receipt of the samples from the Thiokol Corporation.
Thiokol ST	18	
Thiokol PR-1	19	
Thiokol PR-1	20	
GR-S	21	
Perbunan 26	22	
Neoprene	23	
Natural Rubber	24	All stocks were used within eight months after receipt by the Material Laboratory as a participant in a round robin low temperature test program *(4)*. Stocks were supplied by the Government Laboratories, Akron, Ohio.
GR-S	25	
Polybutadiene	26	
Polybutadiene	27	
Polybutadiene	28	
75/25 Butadiene-Styrene	29	
Perbunan 26	30	
85/15 Butadiene/Styrene	31	
80/8/12 Butadiene/ Isoprene/Styrene	32	
GR-S	33	
85/15 Butadiene/Styrene	34	
Perbunan 26	35	
Hevea	36	Hardness determined within six months after receipt of material originally supplied for a round robin program of subcommittee 27 ASTM committee E-1. Stocks were supplied by the Government Laboratories, Akron, Ohio.
Hevea	37	
Hevea	38	
Silicone	39	Hardness of all stocks was determined within one year after receipt of the material. Stocks 39, 44 and 45 were supplied by General Electric Company. Stocks 40-42 were supplied by Stalwart Rubber Company and Stock 43 by International Packings Corp.
Silicone	40	
Silicone	41	
Silicone	42	
Silicone	43	
Silicone	44	
Silicone	45	
Hevea	46	Hardness of all stocks was determined within six months after receipt of materials by Material Laboratory. Stocks were supplied by B. F. Goodrich Company.
Hevea	47	
Hevea	48	
Hevea	49	
Hevea	50	
Hevea	51	
Hevea	52	
Hevea	53	
Hevea	54	
Natural Rubber, Pure Gum	55	Hardness of all stocks was determined within six months after receipt of samples by the Material Laboratory as a participant in a round robin program of ASTM committee E-1, Task Group B. Stocks 55 and 56 were supplied by Government Laboratories, Akron, Ohio. Stocks 57 and 58 were supplied by Bakelite Co.
GR-S	56	
Non-Rigid Vinyl	57	
Polyethylene	58	

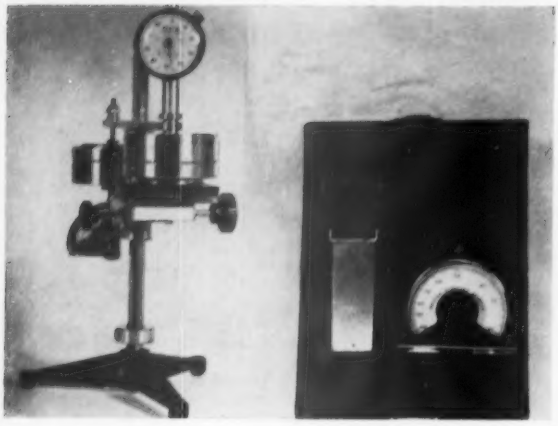


FIG. 1 — Spring-loaded instruments — Rex Dial Gauge Hardness Tester and Shore Type A Durometer with standard load attached (left), and Wallace Hardness Meter and accessories (right).

culty of reading the vernier scale. The width of the graduation marks on the scale and graduated friction pin is nearly equal to the increment of spacing for each five scale points so that a hardness value may be read with an accuracy of only about ±3 points.

Rex Dial Gauge Hardness Tester:—This instrument, at the left in Figure 1, is a modified Rex Gauge in which a dial gage has been substituted for the sliding vernier scale. Decay readings may therefore be obtained with the instrument instead of only a single maximum reading as determined with the standard Rex Gauge. The indentor and lower stem section are identical with those of the standard Rex Gauge. The instrument dial is graduated into 100 equal divisions, or hardness points. This instrument is therefore more easily read than the Rex Gauge; it may be read with a uniform reading accuracy of ±0.3 points. The Rex Dial Gauge Hardness Tester failed to operate properly after less than one hour of exposure at temperatures ranging from −20° to −65°F. *(10)*, due primarily to seizing of the moving parts of the dial gauge.

Another disadvantage of the instrument was its top heavy construction; extreme care was required when applying pressure by method B in order to assure proper contact between the presser foot and specimen surface. Readings obtained with this instrument at low temperatures could not be correlated with comparable readings determined with the other spring-load instruments.

Wallace Hardness Meter:—This instrument, at the right in Figure 1, has a scale graduated from 30 to 100 divisions in single British Standard degrees and each division is scaled to represent the same proportional difference in Young's modulus. Since the scale divisions decrease in width with increase in hardness number, the upper end of the scale may not be read as accurately as the lower end. Also, since an elastomer material deviates from perfect elasticity, the relationship between B.S. hardness and Young's modulus deviates from the assumed relationship *(11)*. Thus, in common with other such instruments, the Wallace Meter is expected to provide less accurate results in tests on the less elastic polymer materials.

The Wallace Hardness Meter was erratic in operation at low temperatures and became inoperative after three hours of exposure at −65°F. *(7)*. Its poor low temperature performance may be partly attributed to excessive friction in various moving parts of the instrument, particularly in two close fitting collars through which passes the spring-activated shaft leading from the indentor. Also, as the indicator needle for the instrument tends to slip in its friction mount, care should be taken to assure tightness of this mount. A desirable feature of the instrument is an external adjustment for the loading spring.

Correlation of Spring-Load Instruments

The hardness of 34 different elastomer samples was determined with the four spring-load instruments at

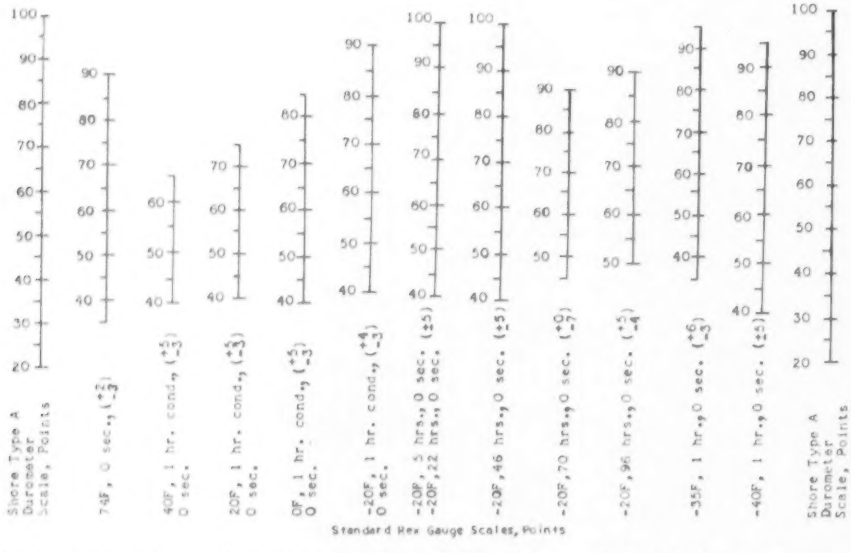


FIG. 2—Correlation chart of Shore Type A Durometer and Standard Rex Gauge, Method A.

eight different temperatures and eight conditioning periods. The results of these tests *(7, 10 and 12-16)* were used to prepare a series of correlation scales and graphs.

The Shore Type A Durometer was selected as the standard of comparison for the spring-type instruments because of its satisfactory low temperature performance and general acceptance in the rubber industry as a hardness testing instrument. Average Shore hardness values for the various samples were plotted as independent variables against average values obtained under equivalent conditions with each of the remaining spring loaded instruments. These plots were used to derive the correlation scales given in Figures 2 through 4. Because the Rex Dial Gauge Hardness Tester failed to operate properly at low temperatures, no correlation chart of low temperature values was drawn for this instrument.

The two Shore reference scales at the extreme right and left in each of Figures 2 through 4, are identical. Hardness values determined with the Shore durometer and with each of the designated instruments under corresponding test conditions may be obtained by drawing lines between equal Shore values on the outer scales to intersect the other scale lines. The use of Figures 2 through 4 as conversion charts is limited, of course, by the reliability of the individual instruments and by the nature of the plots from which the scales were drawn. In some instances the charts show a decrease in hardness for a given stock with decrease in temperature. This is an apparent anomaly resulting from the fact that the individual graphs were average plots and reflect errors resulting from low temperature effects on the instruments and specimens.

The original plots from which the correlation charts were drawn showed varying degrees of displacement of points from the most probable drawn curves. The limits of these displacements are given in parentheses in the charts for each condition of test. Thus the hardness values converted from one scale to another scale are only as reliable as the tolerances specified in each case. The degree of correlation between the Shore durometer and each of the other instruments is determined by the magnitude of these tolerance figures.

The graphs given in Figures 5 through 8 show the overall correlation of Shore Durometer values with those obtained with the other spring-load instruments, including the Rex Dial Gauge Hardness Tester operated at room temperature (74°F.). The hardness values of the

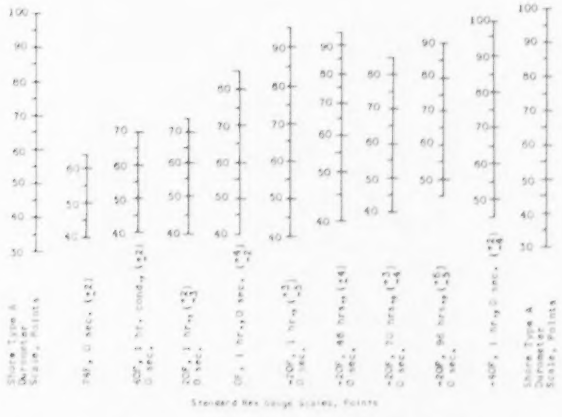


FIG. 3—Correlation chart of Shore Type A Durometer and Standard Rex Gauge, Method B.

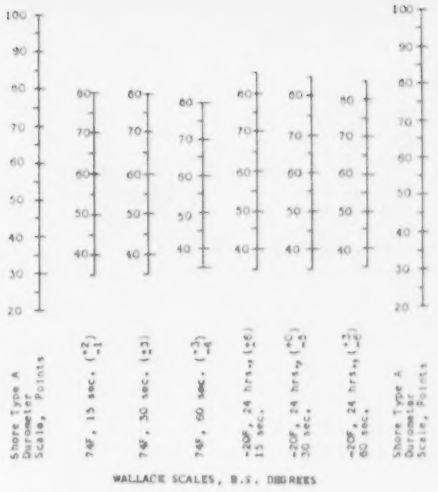


FIG. 4—Correlation chart of Shore Type A Durometer and Wallace Hardness Meter, Method A.

stocks as obtained under the several test conditions were accorded equal weight in plotting the graphs. In these graphs, the degree of correlation is determined by the width of the respective bands which indicate the tolerance limits. Using the Shore Type A Durometer as the standard of comparison, the comparability of the instruments may be summarized as follows:

(1) At room temperature, the Rex Gauge and Wallace Hardness Meter values show good correlation with those of the Shore durometer in tests both by Method A (instrument under 3 pound load) and Method B (instrument under hand pressure). Under the same conditions, the Rex Dial Gauge values exhibit only fair correlation with those of the Shore durometer.

(2) At low temperatures down to −40°F. there is satisfactory correlation between Rex Gauge and Shore durometer values in tests by Method A and poorer correlation by Method B. Comparative tests were not made with the Rex Gauge at temperatures below −40°F.

(3) No correlation can be derived for the Rex Dial Gauge Hardness Tester at low temperatures, in view of the unsatisfactory operation of the instrument under these conditions.

(4) At temperatures down to −20°F. there is satisfactory correlation between Wallace Meter and Shore Durometer values in tests by Method A. In this temperature range the Wallace Meter values are about four points higher than the Shore values. In tests made at −65°F. by Method A the correlation between Wallace Meter and Shore values was so poor that a correlation scale was not warranted.

A study *(7)* was made of the degree of variability of hardness values for the Shore Type A Durometer and the Wallace Meter using nine Hevea materials represented by stocks 46 through 54 of Table I, and covering most of the practical hardness range of each instrument. The results showed that reproducibility was better in the low than in the high end of the scale for each instrument. Shore values obtained in tests at temperatures of 74°F., −20°F. and −65°F. were reproducible to better than ±2 points while Wallace values, obtained under the same conditions, were reproducible to better than

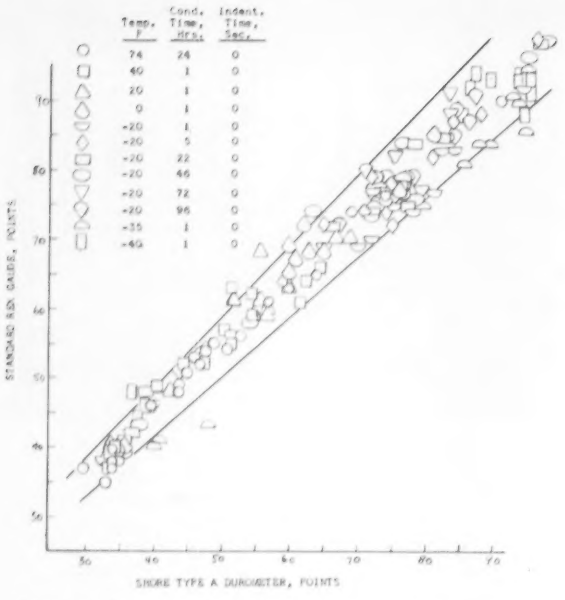


FIG. 5—Correlation of Shore Type A Durometer and Standard Rex Gauge, Method A.

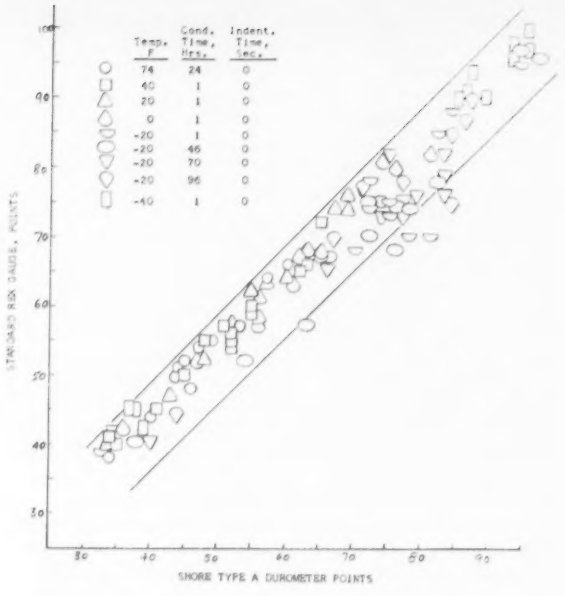


FIG. 6—Correlation of Shore Type A Durometer and Standard Rex Gauge, Method B.

±3 degrees. Standard Rex Gauge values were reproducible to better than ±2 points as determined from a limited study *(9)* at temperatures ranging to −80°F. All four of the spring type instruments described are readily available from the commercial sources shown in Table II.

The ease of operator manipulation of the four spring-load instruments showed no change at the lower temperatures of exposure. The hardness tests were performed at all temperatures with equal facility and simplicity of technique. However, as previously discussed, this does not imply that the instrument characteristics were equally good at all temperatures.

Dead-Weight Hardness Testing Instruments

For the dead-weight instruments the hardness of an elastomer is determined as the depth of indentation produced by an indentor of definite size acting under a specific load for a specified period of time. There are two principal types of deadweight testers, generally referred to as "base plate" and "foot method" instruments.

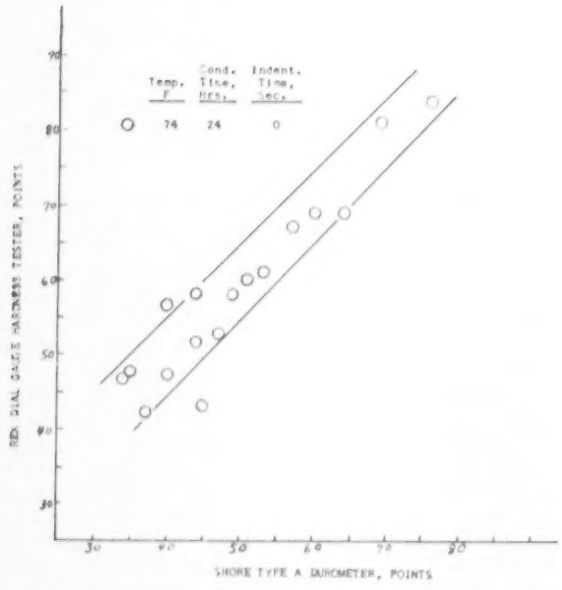


FIG. 7—Correlation of Shore Type A Durometer and Rex Dial Gauge Hardness Tester, Method A.

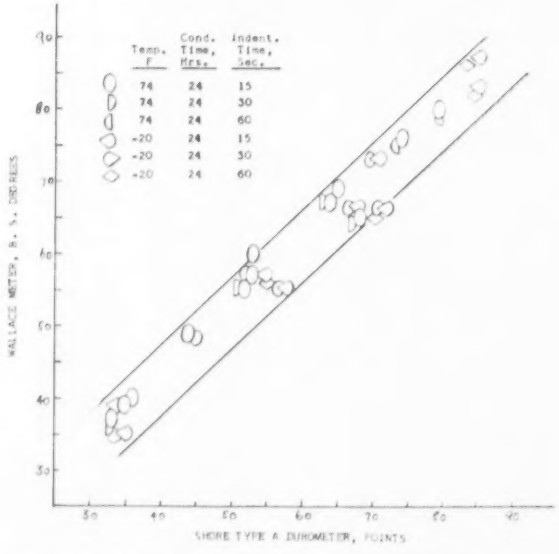


FIG. 8—Correlation of Shore Type A Durometer and Wallace Hardness Meter, Method A.

For the "base plate" instruments the indentor is placed under a minor load before application of the major load. The minor load serves to establish a zero reference point for the indentor. The "foot method" instruments are not designed to use a minor load in their operation since an annular presser foot, concentric with the indentor, serves as a zero reference plane for the indentor.

American standards for two "base plate" instruments, Pusey and Jones Plastometer *(19, 20)* and the Material Laboratory Indentometer *(21)*, specify minor and major loads of 90g and 1 kg, respectively, acting on a 0.1250 inch ball indentor. The latter instrument which is equivalent to the former in all essential respects, was constructed by the Material Laboratory using design features of the two British Admiralty instruments described below.

Two "base plate" instruments of British design constructed by the Material Laboratory for experimental purposes are the Admiralty Rubber Meter *(22)* and the Admiralty Penetrometer *(23)* both operated under minor and major loads of 30g and 535g, respectively. The former instrument uses a 3/32-inch ball indentor and the latter a 1/32-inch ball indentor.

The standard *(24)* for one "foot type" instrument, the Tinius Olsen Tester, specifies a major load of 3 pounds acting on a 0.0938 inch hemispherical indentor together with a presser foot, 0.625 inch O.D., acting under a 5 pound load. Another American instrument, the Aminco tester, appears to be equivalent to the Tinius Olsen Tester in essential respects.

A British instrument of recent design, the Wallace dead-weight hardness tester, may be used either as a "base plate" or a "foot type" instrument by making a simple adjustment from one instrument condition to the other. The standard *(11)* for this instrument specifies minor and major loads of 30g and 535g, respectively, acting on a 3/32-inch ball indentor. In the "foot method" the instrument is used with a presser foot, 20 mm. O.D., acting under a load of 200 to 300g per sq. cm.

From the foregoing description of the standard American and British hardness testing instruments, it is apparent that the differences in indentor size and in the minor and major loads are sufficient to cause marked differences in the magnitude of hardness indentation values obtained. Furthermore, for the several instruments, there are differences in the rate of application of the major load to the indentor and the time intervals at which the readings are made which likewise affect the magnitude of the readings. In addition, the compression of the specimen surface by a presser foot concentric with the indentor produces different values from those obtained with instruments which do not use a presser foot.

Pusey and Jones Instrument:—This instrument has a sprocket and chain assembly for lowering (and raising) the minor and major loads which produces an operator dependent variable due to differences in the rate of load application from one test to another. Furthermore, the sprocket assembly tends to become inoperative at temperatures below −40°F. due to formation of frost, unless precautions are taken to lubricate the moving parts with a suitable lubricant such as Esso aviation instrument oil.

The use of a vibrator attachment for the Pusey and Jones instrument has proved to be effective in minimizing friction effects in the dial indicator and other moving parts. In general, the precision of results obtained with the instrument is increased by use of a vibrator attachment, especially at the lower temperatures of test. This is shown by a limited study of data determined for specimens 55 and 56 of Table I *(9)*. A more extensive study of the standard deviations of the indentation values of stocks 1 through 12, 16, 36 through 38, and 55 through 58 of Table I, showed that Pusey and Jones values obtained with a vibrated instrument were reproducible to better than ±0.04 mm. at temperatures ranging from 75 to −40°F. *(9, 25, 26)*.

Material Laboratory Indentometer:—The Indentometer, when operated with a vibrator, produced hardness values which were reproducible within the limits of ±0.04 mm at temperatures ranging from 74 to −65°F. *(7, 9, 25, 27, 28)*. This value represents 91% of 105 sets of measurements made on stocks 1 through 12, 16, 39, and 44 through 54 of the table. Although precision was slightly better at the higher testing temperatures, there was no significant trend in reproducibility of results as a function of the hardness of the material. For this instrument, reproducibility of results was confirmed by independent measurements made by the Rock Island Arsenal *(29)* and the Material Laboratory *(28)* in tests at 74°F. on eight specimens which included Neoprene, GN, Paracril A, butyl and GR-S type stocks ranging in hardness from 0.79 to 2.11 mm.

TABLE II—SOURCES OF HARDNESS INSTRUMENTS

Instrument	Manufacturer	Distributor
Shore Type A Durometer (a)	Shore Instrument and Mfg. Co., Jamaica, N. Y.	Shore Instrument and Mfg. Co., Jamaica, N. Y.
Standard Rex Gauge (a)	Rex Gauge Co., Chicago, Ill.	W. F. Orth Die and Tool Co., Chicago, Ill.
Rex Dial (a) Gauge Hardness Tester	W. F. Orth Die and Tool Co., Chicago, Ill.	W. F. Orth Die and Tool Co., Chicago, Ill.
Wallace Hardness Meter (a)	H. W. Wallace and Co., Ltd., Croydon, England	Scott Testers, Inc., Providence, R. I.
Pusey and Jones Plastometer (b)	Pusey and Jones Corp., Wilmington, Del.	Pusey and Jones Corp., Wilmington, Del.
Material Laboratory Indentometer (b)	Original model built by Material Laboratory. Currently manufactured by Mast Development Co., Davenport, Iowa	Mast Development Co., Davenport, Iowa
Admiralty Rubber Meter (b)	Built by Material Laboratory from British Specifications and Design (17, 18)	
Admiralty Penetrometer (b)	Built by Material Laboratory from British Specifications and Design	
Tinius Olsen (ASTM) Hardness Tester (b)	Tinius Olsen Testing Machine Co., Willow Grove, Penna.	Tinius Olsen Testing Machine Co., Willow Grove, Penna.
Aminco Hardness Tester (b)	American Instrument Company, Silver Springs, Md.	American Instrument Company, Silver Springs, Md.
Wallace Dead-Load Hardness Tester (b)	H. W. Wallace and Company, Ltd., Croydon, England	Scott Testers Incorporated, Providence, R. I.

(a) Spring-load type, (b) Dead-weight type.

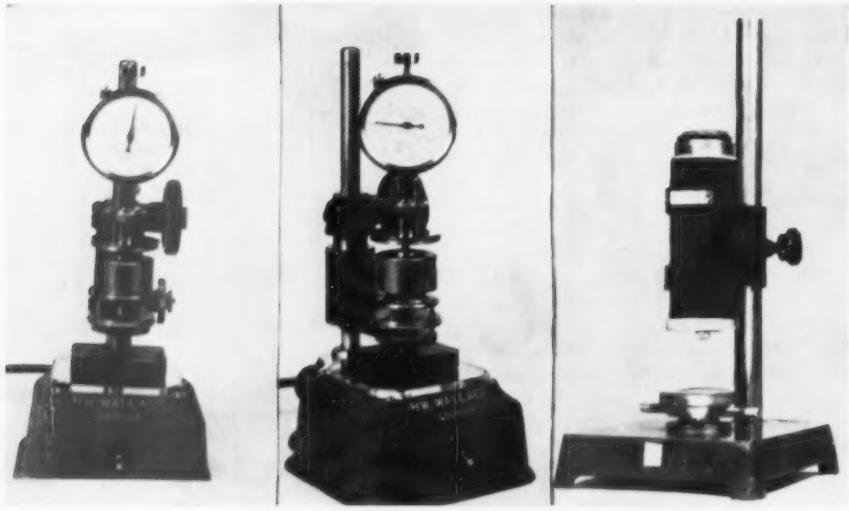


FIG. 9—Minor load application, base plate method, Wallace Hardness Tester, partially disassembled (left); Major load application, base plate method, Wallace Hardness Tester, partially disassembled (center); Aminco Hardness Tester (right).

A feature of the Indentometer, which bears on the comparison of this instrument with other such testers, is the manner of application of the major load to the instrument indentor. In using the Indentometer the major load weight, which is concentric with the dial gage stem, is lowered to rest on the upper end of the stem in point contact with it. Since the lower end of the stem terminates in the indentor foot, there is positive mechanical linkage between all these moving parts of the instrument.

British Admiralty Rubber Meter and British Admiralty Penetrometer:—These instruments *(17, 18, 23)* which were used as models in designing the Material Laboratory Indentometer, are operated in the same manner as the Indentometer. They differ from the latter instrument only with respect to minor and major load, and indentor characteristics. The Admiralty Rubber Meter and the Admiralty Penetrometer both use a 30gm minor load and a 535gm major load; they have a 3/32-inch and a 1/32-inch diameter ball indentor, respectively. Due to comparable design features, the behavior of the two British instruments at low temperatures is equivalent to that of the Indentometer with respect to ease of manipulation and efficiency of operation. Reproducibility of hardness data obtained with the two British instruments is at least ±0.04 mm. when the instruments are used with a vibrator in the temperature range from 74 to −40°F. *(22, 23)*.

Under comparable conditions of test the indentation readings obtained with the Admiralty Rubber Meter and the Penetrometer instrument are higher and lower, respectively, than those of the Material Laboratory Indentometer. This is due to differences in major load and indentor characteristics of the respective instruments. A discussion of the effect of indentor characteristics and the amount of major load applied to the indentor on depth of indentation has been given by Scott *(30)* and Boor *(31)*.

A study of the data determined for stocks 1 through 12 and 16 through 23 of Table I, which were obtained under similar conditions *(22)* of test at temperatures ranging from 74 to −40°F., shows that the British Admiralty Rubber Meter indentation readings are approximately 67% lower in magnitude than the (interpolated) Material Laboratory Indentometer values. Likewise, the Admiralty Penetrometer readings *(23)* are about 130% higher than the corresponding Indentometer values.

Tinius Olsen Tester:—One of the important features of this tester *(24, 32)* is its simply operated mechanism for rapid application of major load to the indentor. The dial gage for the instrument is mounted on the presser foot assembly; it has a clearly defined zero point setting which is referenced on a glass surface. The instrument, when properly lubricated, operates efficiently and free of frost friction effects after at least eight hours of continuous exposure at temperatures down to −65°F. *(27, 33)*.

The Tinius Olsen Tester was used to determine the hardness of elastomers as represented by stocks 1 through 12, 16 *(33)*, and 46 through 54 *(27)*, listed in Table I. The tests were made at temperatures ranging from 74 to −65°F. In tests at 74 and −20°F., reproducibility of the data was generally slightly, but not significantly better for the softer stocks than for the harder stocks. At a testing temperature of −65°F., the reproducibility of data was essentially the same over the entire specimen hardness range. Precision of the results was generally unaffected by decrease in temperature or by changes in indentation time within the range from 15 to 60 seconds. The indentation values were reproducible within the limits of ±0.003 inches at all testing temperatures.

Aminco Hardness Tester:—This instrument, illustrated at the right in Figure 9, is a foot type tester which is in conformity with ASTM standards *(24)* in all essential respects. When properly lubricated, the instrument can be operated free of frost friction effects for periods exceeding eight hours of continuous exposure at temperatures as low as −65°F. *(27)*. In using the instrument, a specimen is raised to testing position under the instrument presser foot by elevating the specimen platform on a jack-screw. This mechanism permits only a slow rate of load application with consequent difficulty in determining the instant at which the full major

load has been applied to the indentor foot. Another disadvantage of the instrument is the horizontal position of the dial scale, making it necessary to view the scale from above.

A study of the data obtained in tests on stocks 46 through 54 *(27)* of Table I, evaluated at temperatures of 74, —20, and —65°F., showed no significant dependence of precision on either test temperature, specimen indentation reading time, or specimen hardness. Precision remained nearly constant for all testing conditions. In general, reproducibility of hardness indentation values was at least ±0.003 inches at testing temperatures of 74, —20, and —65°F. and at indentation times from 15 to 60 seconds.

Wallace Hardness Tester:—An outstanding feature of this (British) instrument is that it may be used either as a foot or as a base plate tester by making a relatively simple adjustment in its operating mechanism. In the foot method the dial indicator is a part of and moves with the annular presser foot assembly. The flat contact face of the foot measures 0.8 inch O.D. by 0.20 inch I.D. and is used as the reference surface in measuring indentation. In the base plate method, the presser foot is removed and the dial indicator remains in a fixed position relative to the specimen base plate. The unit as shown in the left and center of Figure 9, reveals the internal components of the instrument in the application of minor and major loads by the base plate method. The outer connecting shell has been removed.

The Wallace instrument is used in accordance with British standards *(11)* in a manner similar to that specified in American specifications *(19, 24)*. Its rate of load application is rapid both for the foot and the base plate methods of operation. In both cases the zero point, 100 on the dial gage, must be reset for each reading. As in the case of the Wallace (spring-load) Hardness Meter, the increments between scale divisions for the Wallace dead-load tester decrease in width with increase in hardness number. Thus, the upper portion of the scale, representing harder stocks, may not be read quite as accurately as the lower portion.

As would be expected, the hardness indentation values obtained by the foot and base plate methods of operating the Wallace Tester were slightly different. The foot method of operation produced values approximately 2 B.S. degrees greater (smaller indentation) than the base plate method at testing temperatures of 74° and —20°F., and up to 15 B.S. degrees greater at —65°F., *(7)*. The latter effect was most pronounced in the lower (softer stock) and intermediate regions of the scale.

After suitable lubrication, the Wallace tester's foot method mechanism operated with a minimum of friction effects for periods exceeding eight hours of exposure at —65°F. *(7)*. However, the mechanism used for operation of the base plate method became inoperative due to freezing after exposure for two hours at either —20 or —65°F. *(7)*. Also, the 110 volt A.C. vibrator for the instrument failed to operate when used intermittently during the low temperature exposure period. It operated satisfactorily when energized during the entire period.

Precision of results was about the same for the foot and base plate methods of operating the Wallace Tester. A study of the data obtained in tests on stocks 46 through 54 *(7)*, listed in Table I revealed that at testing temperatures of 74 and —20°F. the results were generally less precise in the high hardness scale range of the instrument than in the low scale range (softer stocks). In this respect there was no significant trend in precision of results at a testing temperature of —65°F.

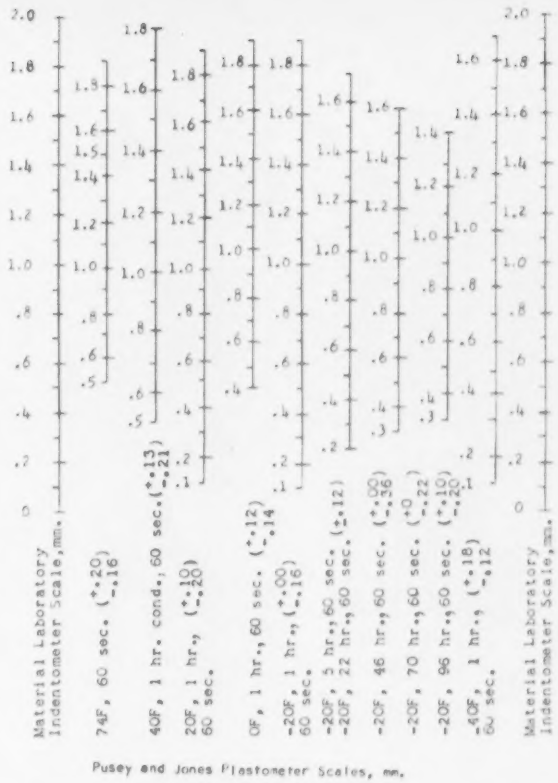

Material Laboratory Indentometer Scale, mm.
74F, 60 sec. (+.20 -.16)
40F, 1 hr. cond., 60 sec. (+.13 -.21)
20F, 1 hr., 60 sec. (+.10 -.20)
0F, 1 hr., 60 sec. (+.12 -.14)
-20F, 1 hr., 60 sec. (+.00 -.16)
-20F, 5 hr., 60 sec. (±.12)
-20F, 22 hr., 60 sec. (±.12)
-20F, 46 hr., 60 sec. (+.00 -.18)
-20F, 70 hr., 60 sec. (+0 -.22)
-20F, 96 hr., 60 sec. (+.10 -.20)
-40F, 1 hr., 60 sec. (+.18 -.12)
Material Laboratory Indentometer Scale, mm.
Pusey and Jones Plastometer Scales, mm.

FIG. 10—Correlation chart of Pusey and Jones Plastometer and Material Laboratory Indentometer, vibrated operation.

The data also showed that precision of the readings decreased progressively as the testing temperature was decreased from 74 to —65°F.

Correlation of Dead-Weight Testing Instruments

Hardness indentation tests were made on 39 different elastomers with seven dead-weight instruments operated at eight different temperatures and eight conditioning periods. The results have been summarized in a series of Material Laboratory reports *(7, 9, 22, 23, 25, 27, 28, 34)* and were used in preparing a series of correlation scales and graphs. The Material Laboratory Indentometer was selected as the standard of comparison for the dead-weight instruments in view of its good performance at low temperatures and because the Laboratory has obtained extensive data with it.

Correlation charts were drawn from plots, using Material Laboratory Indentometer values as the independent linear variables, in the same manner as described for the spring-load hardness testing instruments. These scales with the test temperatures, indentation reading times, and the respective limits of variability (in parentheses) are presented in Figures 10 through 16. Also, graphs showing the correlation between data obtained with the Indentometer and the other dead-weight testers operated under various conditions of test are given in Figures 17 through 23.

The two Indentometer reference scales at the extreme right and left in each of Figures 10 through 16 are identical. Hardness values determined with the Ma-

terial Laboratory Indentometer and with each of the designated instruments under corresponding test conditions may be obtained by drawing lines between equal Indentometer values on the outer scales to intersect the other scale lines. The use of Figures 10 through 16 as conversion charts is limited by the same considerations as those discussed previously for the spring-load instruments. Also, the apparent anomalies in indentation values are caused by the same factors as discussed in connection with the correlation charts for the spring-load instruments. No charts or graphs were drawn for the Wallace Tester operated at a temperature of —65°F. because the plots of data obtained with the instrument at this temperature were too scattered to indicate any valid relationships.

An examination of Figures 10 through 23 shows too much variation in scales and graphs to permit the derivation of a single valid conversion formula or scale for correlating one instrument with another under all conditions of test.

A study of the correlation charts and graphs in Figures 10 through 23 reveals a number of points concerning comparisons of the Material Laboratory Indentometer with the other dead-load instruments which may be summarized as follows:

(1) Indentation values obtained with the Pusey and Jones Plastometer, the British Admiralty Rubber Meter, the British Admiralty Penetrometer, and the Tinius Olsen and Aminco Hardness Testers exhibit good linear

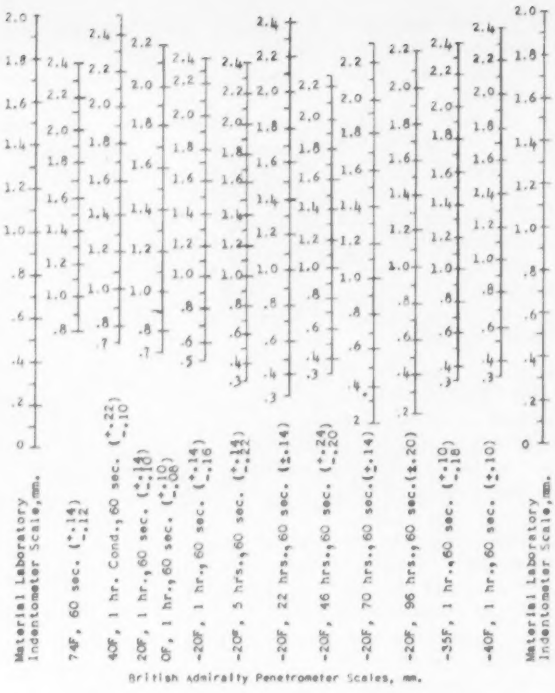

Material Laboratory Indentometer Scale, mm.
74F, 60 sec. (+.14 −.12)
40F, 1 hr. Cond., 60 sec. (+.22 −.10)
20F, 1 hr., 60 sec. (+.10 −.10)
0F, 1 hr., 60 sec. (+.10 −.06)
-20F, 1 hr., 60 sec. (+.14 −.16)
-20F, 5 hrs., 60 sec. (+.14 −.12)
-20F, 22 hrs., 60 sec. (±.14)
-20F, 46 hrs., 60 sec. (+.24 −.20)
-20F, 70 hrs., 60 sec. (±.14)
-20F, 96 hrs., 60 sec. (±.20)
-35F, 1 hr., 60 sec. (+.10 −.18)
-40F, 1 hr., 60 sec. (±.10)
Material Laboratory Indentometer Scale, mm.
British Admiralty Penetrometer Scales, mm.

FIG. 12—Correlation chart of British Admiralty Penetrometer and Material Laboratory Indentometer, vibrated operation.

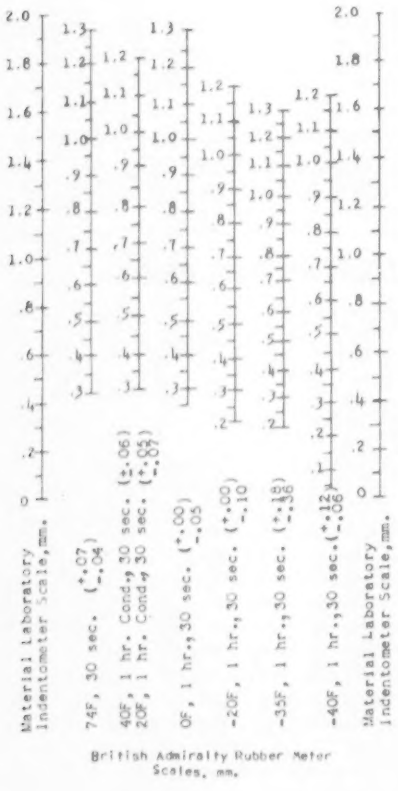

Material Laboratory Indentometer Scale, mm.
74F, 30 sec. (+.07 −.04)
40F, 1 hr. Cond., 30 sec. (±.06)
20F, 1 hr. Cond., 30 sec. (+.05 −.07)
0F, 1 hr., 30 sec. (+.00 −.05)
-20F, 1 hr., 30 sec. (+.00 −.10)
-35F, 1 hr., 30 sec. (+.18 −.38)
-40F, 1 hr., 30 sec. (+.12 −.06)
Material Laboratory Indentometer Scale, mm.
British Admiralty Rubber Meter Scales, mm.

FIG. 11—Correlation chart of British Admiralty Rubber Meter and Material Laboratory Indentometer, vibrated operation.

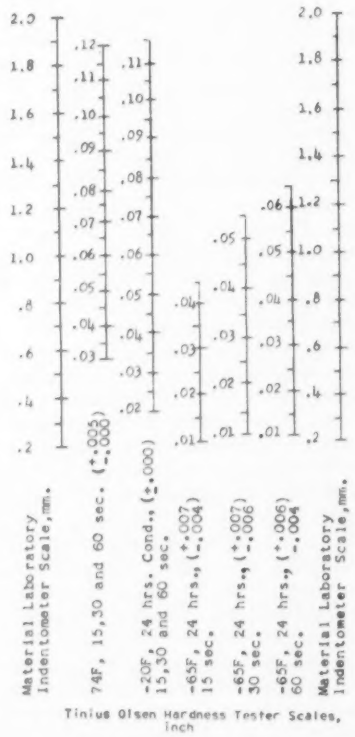

Material Laboratory Indentometer Scale, mm.
74F, 15, 30 and 60 sec. (+.005 −.000)
-20F, 24 hrs. Cond., 15, 30 and 60 sec. (±.000)
-65F, 24 hrs., 15 sec. (+.007 −.004)
-65F, 24 hrs., 30 sec. (+.007 −.006)
-65F, 24 hrs., 60 sec. (+.006 −.004)
Material Laboratory Indentometer Scale, mm.
Tinius Olsen Hardness Tester Scales, inch

FIG. 13—Correlation chart of Tinius Olsen Hardness Tester (not vibrated), and Material Laboratory Indentometer (vibrated).

correlation with values determined with the Material Laboratory Indentometer over a temperature range from 74 to —40°F. and from 74 to —65°F. In general, the correlation is slightly better at the higher testing temperatures than at the lower temperatures.

(2) The data obtained with the Wallace Tester using both the foot and base plate methods show good correlation with those of the Material Laboratory Indentometer in tests at 74°F. This correlation is generally exponential. However, at a testing temperature of —20°F. the correlation becomes significantly poorer and at —65°F. the correlation is so poor that no correlation curve or chart is warranted.

(3) An increase in indentation reading time from 15 to 30 to 60 seconds has no significant effect on correlation of data obtained with the Material Laboratory Indentometer and the other dead-load instruments at the testing temperatures which ranged from 74°F. to —65°F.

The British Admiralty Rubber Meter *(22)* and the Penetrometer *(23)* were constructed by the Material Laboratory and are not known to be available commercially except as modifications of a commercial model of the Indentometer *(35)*. The Aminco Hardness Tester

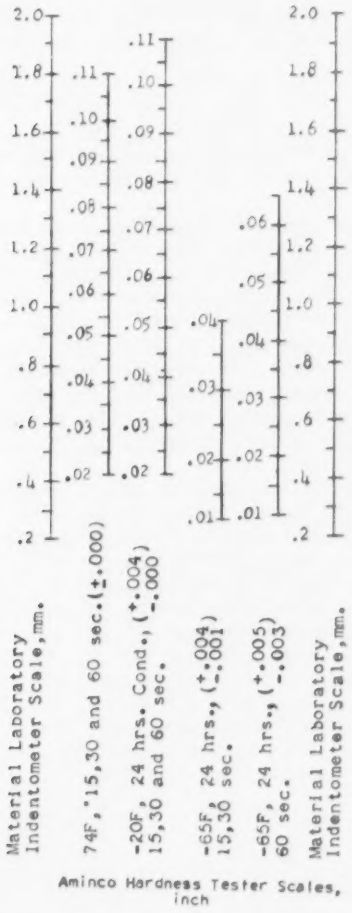

Material Laboratory Indentometer Scale, mm.
74F, 15,30 and 60 sec. (±.000)
-20F, 24 hrs. Cond., (+.004 -.000) 15,30 and 60 sec.
-65F, 24 hrs., (+.004 -.001) 15,30 sec.
-65F, 24 hrs., (+.005 -.003) 60 sec.
Material Laboratory Indentometer Scale, mm.
Aminco Hardness Tester Scales, inch

FIG. 14—Correlation chart of Aminco Hardness Tester (not vibrated), and Material Laboratory Indentometer (vibrated).

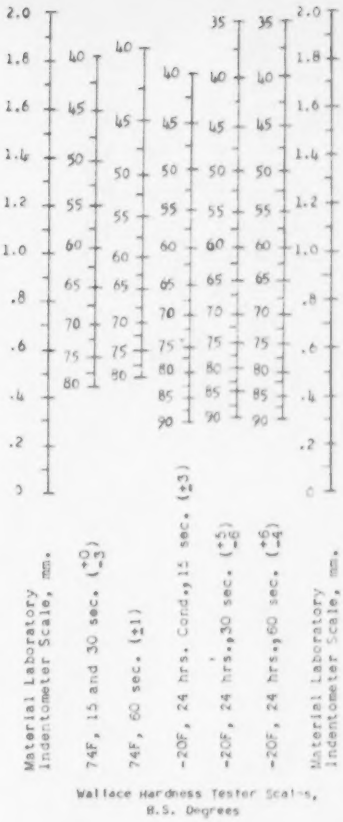

Material Laboratory Indentometer Scale, mm.
74F, 15 and 30 sec. (+0 -3)
74F, 60 sec. (±1)
-20F, 24 hrs. Cond., 15 sec. (±3)
-20F, 24 hrs., 30 sec. (+5 -8)
-20F, 24 hrs., 60 sec. (+6 -4)
Material Laboratory Indentometer Scale, mm.
Wallace Hardness Tester Scales, B.S. Degrees

FIG. 15—Correlation chart of Wallace Hardness Tester, foot method, and Material Laboratory Indentometer, vibrated operation.

used by the Laboratory was an experimental model provided by the manufacturer and is not known to be available commercially. The remaining dead-load instruments are the standard models which may be purchased from the manufacturers and distributors who are listed in Table II.

The relative ease of manipulation and operation of the various dead-load instruments used in the hardness program varied according to the structural features of each. For this reason a detailed discussion of their low temperature manipulation has been confined to the preceding sections. In general, however, the Material Laboratory Indentometer, the Tinius Olsen and Aminco Testers, and the British Rubber Meter and Penetrometer suffered no significant operational deficiencies at low temperatures while the Pusey and Jones and Wallace instruments operated with serious difficulties under the same conditions.

Spring-Load vs. Dead-Weight Instruments

These two general classes of instruments (spring-load and dead-weight) are too divergent in their characteristics to expect equivalence; they have different load magnitudes, load mechanisms, and indentor dimensions. Also, as pointed out by L. Boor *(31)*, differences in indentation reading time, especially in the temperature ranges where second order transitions occur, will render

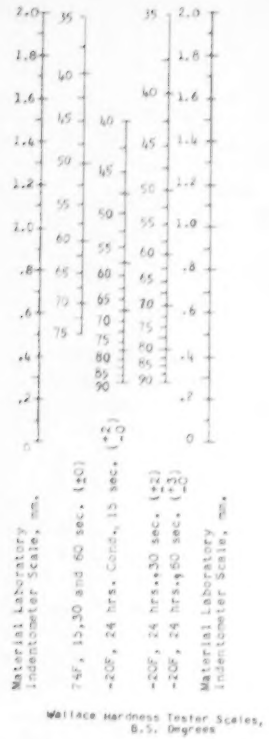

Material Laboratory Indentometer Scale, mm.
74F, 15,30 and 60 sec. (±0)
-20F, 24 hrs. Cond., 15 sec. (±2) (±0)
-20F, 24 hrs.+30 sec. (±2) (±0)
-20F, 24 hrs.+60 sec. (±0)
Material Laboratory Indentometer Scale, mm.
Wallace Hardness Tester Scales, B.S. Degrees

FIG. 16 — Correlation chart of Wallace Hardness Tester, base plate method, and Material Laboratory Indentometer, vibrated operation.

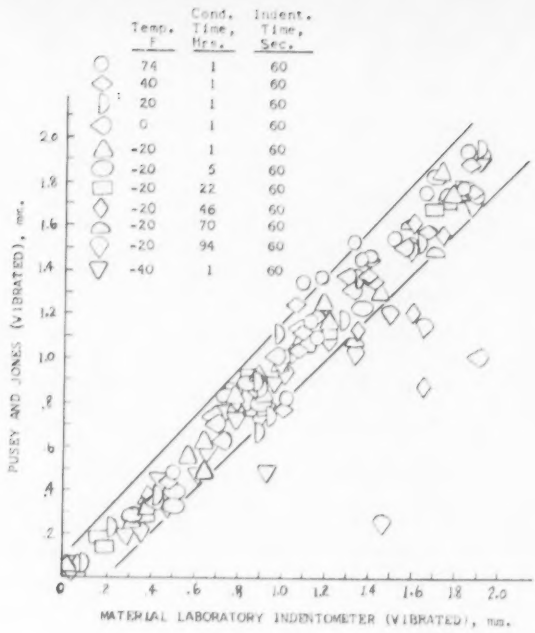


FIG. 17—Correlation of Material Laboratory Indentometer and Pusey and Jones Plastometer.

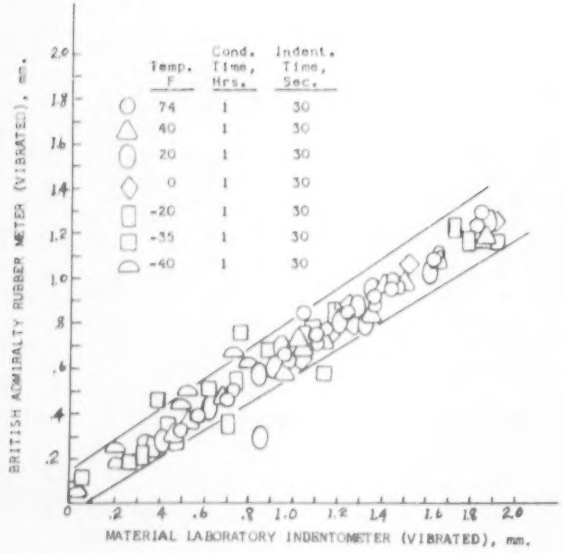


FIG. 18—Correlation of Material Laboratory Indentometer and British Admiralty Rubber Meter.

questionable any simple conversion scale. This is true even among instruments of the same class as a result of differences in visco-elastic properties of different elastomers.

Both spring-load and dead-weight instruments detect gross differences in characteristics of elastomers as measured by changes in their hardness at low temperatures. However, the spring-load instruments are less sensitive than the dead-weight testers, *(10, 12, 26)* particularly at low temperatures where the degree of indentation decreases and greater sensitivity is required to detect changes in hardness of the harder elastomers. It is therefore understandable why the spring-load and dead-weight instruments should not be considered interchangeable.

The range of polymers to which the spring-load and dead-weight instruments may be applied at low temperatures is limited only by hardness changes sufficient to exceed the instrument scale ranges normally associated with materials in the elastic state. In this respect the sensitivity of these instruments decreases with increase in flexural modulus of the elastomer material, particularly at a modulus greater than 10^4 psi *(2)*. The practical limit for evaluation of hardness with the spring-load instruments is about 95 points or B. S. degrees. Among the dead-weight instruments, a practical upper limit of hardness occurs at approximately 0.10 mm., 0.009 inches, or 95 B. S. degrees.

Summary

Four spring-load and seven dead-weight instruments were evaluated for use in determining the hardness of elastomers at 74°F. and at low temperatures. The Material Laboratory has arrived at an order of relative merit for these instruments, based on their design features, the effects of low temperatures on their mechanical operation, the reproducibility of hardness data, and the

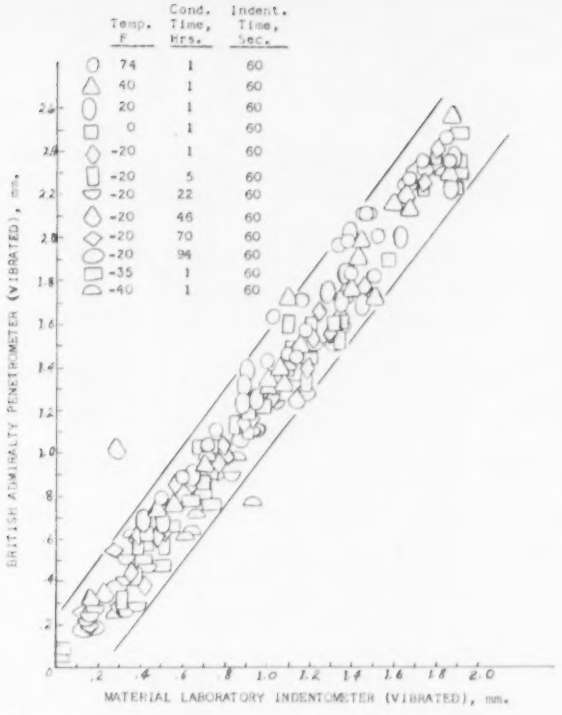


FIG. 19—Correlation of Material Laboratory Indentometer and British Admiralty Penetrometer.

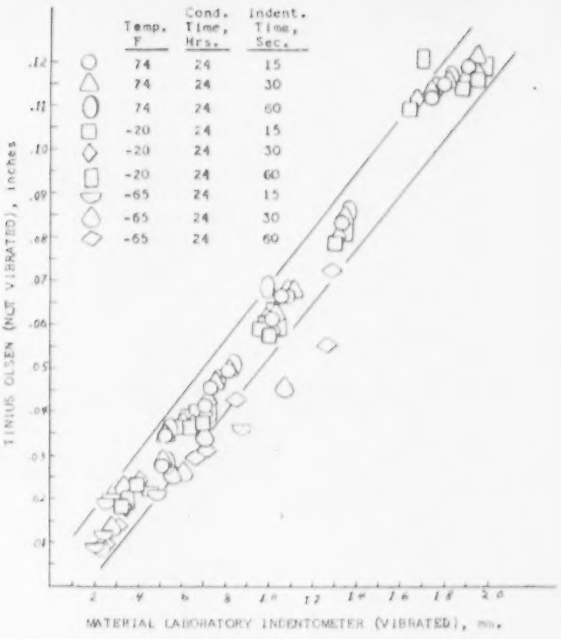


FIG. 20—Correlation of Material Laboratory Indentometer and Olsen Tester.

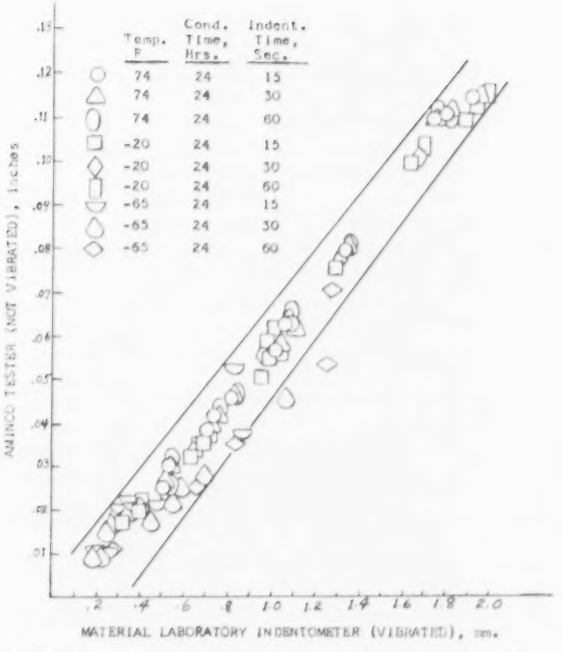


FIG. 21—Correlation of Material Laboratory Indentometer and Aminco Tester.

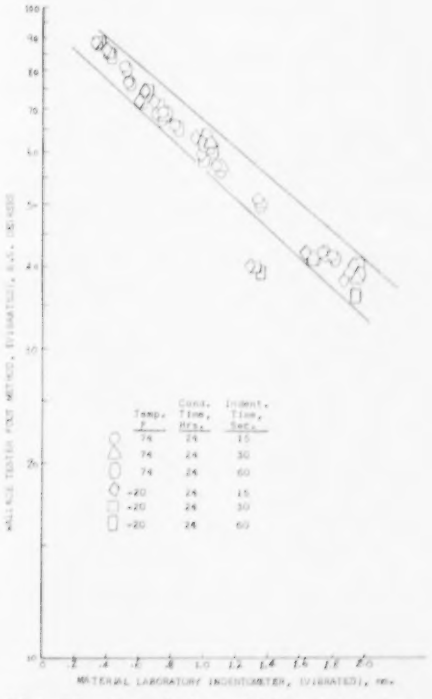


FIG. 22—Correlation of Material Laboratory Indentometer and Wallace Tester, foot method.

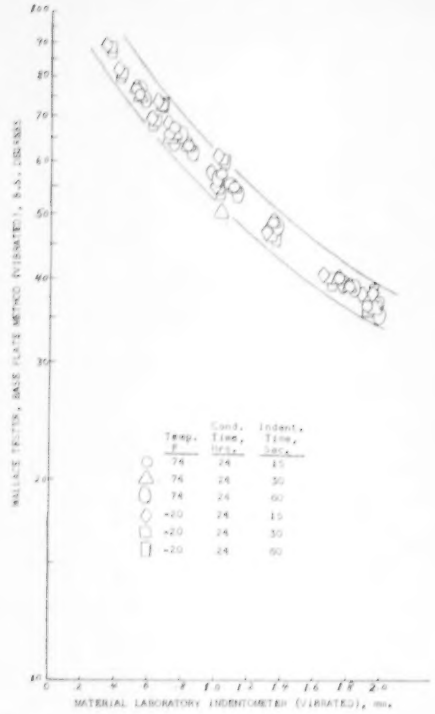


FIG. 23—Correlation of Material Laboratory Indentometer and Wallace Tester, base plate method.

correlation between instruments of the same class. Consideration of the conformity of the various instruments with specific test standards did not enter into the relative ratings.

Among the spring-load instruments the Shore Type A Durometer is considered somewhat superior to the standard vernier scale Rex Gauge. The Wallace Hardness Meter is inferior to both of these instruments for low temperature use, and is unsuitable for use at temperatures as low as —65°F. The Rex Dial Gauge Hardness Tester is considered unsuitable for use at —20°F. or lower temperatures.

The Material Laboratory Indentometer, British Admiralty Rubber Meter, British Admiralty Penetrometer, and the Tinius Olsen Tester are considered the most suitable for use at temperatures as low as —65°F. in the order of relative merit of the various dead-weight instruments. The Pusey and Jones Plastometer and the Aminco Hardness Tester rank second. The Wallace Hardness Tester is not recommended for use at temperatures as low as —65°F., but produces sufficiently reproducible data and operates sufficiently well to warrant its use at temperatures as low as —20°F. as a third ranking alternate to the other dead-load instruments.

ACKNOWLEDGMENT

The authors are indebted to D. H. Kallas of the Material Laboratory for his assistance in reviewing this paper and for providing constructive suggestions during the course of the work. Also, it is desired to thank A. Lichtman for preparing the charts and graphs included in the paper.

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A Non-Blooming High Temperature Resistant Vulcanizing Agent

for Natural and Synthetic Rubbers

By K. R. CRANKER and V. H. PERRINE

Thiokol Chemical Corporation, Trenton 7, New Jersey

A NEW liquid vulcanizing agent—VA-7—is available for vulcanization of GR-S, nitrile and natural rubbers. Outstanding features of this product include such properties as its ease of dispersion in rubbers, non-blooming in cured and uncured stocks and the excellent heat aging of the cured rubbers at 250° and 300°F. Because of its ease of dispersion, the new material has been used as a vulcanizing agent for white sidewall tire compounds. Nitrile rubbers vulcanized with it for molded goods display excellent retention of tensile strength, elongation and hardness in hot oils at 250°F.

Benzothiazyl disulfide, litharge, Methyl Zimate, Monex, Ledate and Selenac may be used as accelerators for VA-7 cures. The combinations of Methyl Zimate with VA-7 will produce rapid cure of natural, nitrile and GR-S rubbers. Relatively small amounts are required for complete vulcanization. Other applications for which this product is being used successfully include synthetic cements, mechanical goods, printing plates and rolls, camelback and cable insulation.

Mechanism of Vulcanization

It is well established that when unsaturated elastomers are vulcanized with sulfur alone, much of the sulfur is unused or consumed in side reactions. The efficiency of sulfur used is low in forming the desired cross-links for the cured state. Accelerators improve the cross-linking efficiency of the sulfur but some sulfur is still uncombined or loosely bound in the system. As a consequence, the reaction of the elastomer with the sulfur can continue after the cure, especially if the vulcanizate is subjected to high temperatures. Thus, continued cure or overcure results in compounds which have poorer physical properties, especially elongation and tensile strength. The excess uncombined sulfur will tend to migrate to the surface resulting in an even higher concentration of sulfur. The higher the concentration of sulfur, the more severe is the deterioration of physical properties on heat aging.

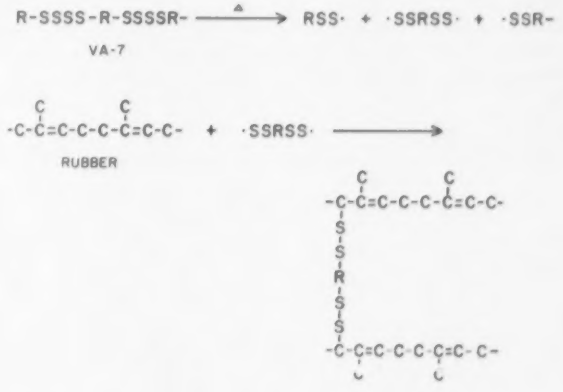
VA-7 is essentially an organic polysulfide polymer. Its structure may be expressed as follows:

$$-R-(S)_n-R$$

where $_n$, the sulfur rank, averages 4.5 and R is an aliphatic ether.

In VA-7 the sulfur is combined and therefore cannot migrate or bloom. Based on the work of Bloomfield *(1)*, the mechanism of vulcanization of a polysulfide polymer such as VA-7 may be postulated as a cleavage into diradicals which can react with and cross-link unsaturated elastomers.

The mechanism for the vulcanization of rubber with VA-7 has been postulated as follows *(2)*:



Thus, alykyl polysulfide polymers of the VA-7 type will vulcanize elastomers by splitting into fragments which can cross-link the rubber segments. The lengths of the cross-link would be much longer than those formed by sulfur so that a difference in the properties of the vulcanizate would be expected. If sulfur and VA-7 were equally efficient in producing cross-links, a greater weight of VA-7 would be needed because of the greater length of cross-link. However, the efficiency of sulfur

Note: This paper was presented before the 70th Meeting of the Division of Rubber Chemistry, American Chemical Society, Atlantic City, N. J., September 19-21, 1956.

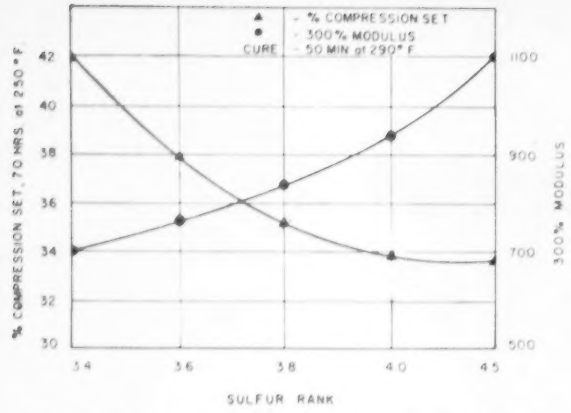


FIG. 1—Effect of varying sulfur rank in VA-7 on a GR-S cure.

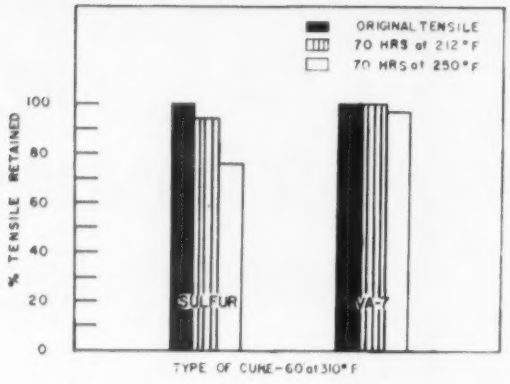


FIG. 2—Heat aging properties of GR-S mechanical goods compounds.

is known to be low and about the same weight of VA-7 will replace sulfur in a cure. This leads to the conclusion that this new vulcanizing agent must be much more efficient than sulfur in producing cross-links. The different type of mechanism of vulcanization would account for the differences in physical properties of the cured rubbers.

Sulfur Rank in VA-7

The sulfur rank in VA-7 was selected as 4.5 after a series of tests were conducted to determine the effect of rank on the rate and state of cure of various elastomers. The data from these studies indicate that with increasing rank the modulus of the cured vulcanizate increases and the percent compression set decreases to a value which leveled off between a rank of 4.0 to 4.5. The effect of varying rank on modulus and per cent compression set is shown in Figure 1. The data for this graph were obtained with a GR-S compound loaded with 50 parts of an easy processing channel black and vulcanized with 3.0 parts of VA-7. The tensile strength of the GR-S compound retained after aging 70 hours at 250°F. was 60 per cent higher than that of the sulfur control when the rank of the sulfur in VA-7 was 4.0 or 4.5.

TABLE I—NATURAL RUBBER VA-7 COMPOUND

Formulation	Sulfur	VA-7
Smoked Sheet	100	100
SAF Black	40	40
Zinc Oxide	5	5
Stearic Acid	3	3
Paraflux 2016	2	2
Circosol 2XH	2	2
Antioxidant	2	2
Tuads	0.4	—
Sulfur	1.5	—
Monex	—	0.5
VA-7	—	1.5
Physical Properties of Smoked Sheet Formulation (Cure 30' @ 298°F.)		
300% Modulus	1225	1150
Tensile, psi	3900	4100
Elongation, %	530	600
Hardness, Shore A	65	63

Properties of the Vulcanizates

Because VA-7 is a liquid, it disperses very readily in rubber stocks and has intimate contact with the rubber. Moderate amounts of VA-7 (1.25 to 1.50 per 100 of rubber) with an accelerator will vulcanize rubbers comparable to sulfur. A comparison of VA-7 and sulfur in natural rubber compounds is shown in Table I.

The good dispersion properties of the new vulcanizing agent offers many benefits to the rubber industry. The cable industry, for example, has encountered serious problems due to corrosion of the copper wire by poorly dispersed and uncombined sulfur. VA-7 may be substituted for the sulfur in GR-S and rubber compounds, and no corrosion is observed. A white sidewall manu-

TABLE II—NON-BLOOM NITRILE RUBBER COMPOUND FOR MOLDED GOODS

Nitrile Rubber	100
Zinc Oxide	5
FEF Black	50
Stearic Acid	1
Antioxidant	1
TP-95	20
MBTS	2.0
Vultrol	1.0
Methyl Zimate	0.5
VA-7	1.25

Properties of Non-Bloom Nitrile Rubber Compound

	Tuads Cure	VA-7 Cure
Original Mooney @ 212°F.	45	42
Mooney Scorch @ 250°F.		
4 pt. rise	16	11
10 pt. rise	19	13
% Compression Set, 70 Hours @ 250°F.		
8' Cure @ 250°F.	76	71
10' Cure @ 250°F.	68	70
Stress-Strain Data on Non-Bloom Compound 8' Cure @ 310°F.		
	Tuads Cure	VA-7-Zimate
200% Modulus	700	675
300% Modulus	1400	1300
Tensile, psi	2200	2550
Elongation, %	450	600
Hardness, Shore A	56	60

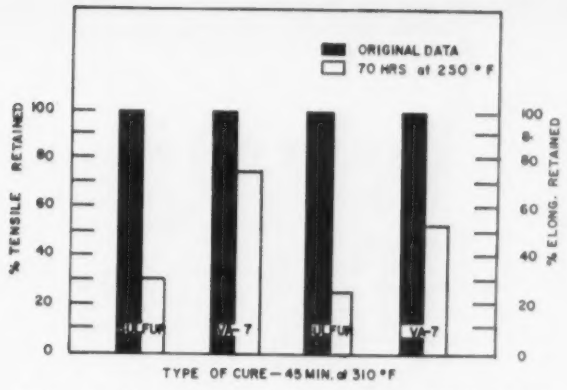


FIG. 3—Heat aging properties of GR-S tread compounds.

facturer is now using vulcanization with VA-7 to replace sulfur curing, thereby eliminating serious dispersion problems that manifested themselves when sulfur specks caused yellowing of the compound.

VA-7 does not exhibit bloom in GR-S or nitrile or natural rubbers. This is true for uncured and cured stocks. No bloom is observed in stocks containing as much as 4 to 5 parts of VA-7. VA-7 compounds are used for brake cup, camelback and white sidewall applications for which the lack of bloom is an essential requirement. A typical non-bloom nitrile rubber compound is shown in Table II.

Synthetic rubber compounds cured with VA-7 display excellent retention of tensile strength, elongation and hardness at temperatures of 250° and 300°F. Mechanical goods compounds from GR-S retain 97 per cent of their tensile strength after exposure for 70 hours at 250°F. This effect is shown in Figure 2. Tread compounds from GR-S and natural rubber, which have always aged poorly at elevated temperatures when cured with sulfur, will retain 20 to 35 per cent more tensile strength and elongation if they are vulcanized with VA-7. The heat aged properties of the tread compounds are shown in Figures 3 and 4. Fast curing nitrile rubber compounds with VA-7 will yield 35 to 50 per cent higher tensile strengths than Tuads and sulfur cured compounds following an exposure of 70 hours at 300°F. The heat aged tensile strengths of nitrile rubber compounds are shown in Figure 5.

TABLE III—VA-7 ACCELERATED GR-S MECHANICAL GOODS FORMULATION

Masterbatch		Compound	
GR-S 1502	100	Masterbatch	174
FEF Black	25	VA-7	1.5
SRF Black	40	MBTS	3.0
Zinc Oxide	5	Methyl Zimate	0.75
Stearic Acid	1		
Antioxidant	3		

Properties of Fast Curing GR-S Compound

Mooney Scorch, Min.	VA-7-Zimate	Sulfur-Litharge
4 point rise	6	5
10 point rise	8	6
% Compression Set 70 Hrs. @ 250°F.		
30′ Cure @ 310°F.	30	48
60′ Cure @ 310°F.	28	39

Stress-Strain Data on GR-S Fast Curing Compound

15′ Cure @ 310°F.	Sulfur Control	VA-7-Methyl Zimate
200% Modulus	1525	1625
300% Modulus	2300	2275
Tensile, psi	2475	2325
Elongation, %	320	320
Hardness, Shore A	70	70

Nitrile rubber compounds formulated for applications requiring low temperature flexibility have shown a few degrees improvement when vulcanized with VA-7 substituted for sulfur or Tuads.

Acceleration for Cures

VA-7 may be varied from 1.25 to 2.0 parts in GR-S, nitrile and natural rubber compounds and accelerated with small amounts of primary and secondary accelerators to produce fast curing compounds having a 4 point Mooney rise of 0 to 10 minutes. Accelerators such as Selanac, Ledate and Methyl Zimate at concentrations of 0.3 to 1.0 part with 1.5 parts of VA-7 will cure GR-S compounds within 10 to 15 minutes at 320°F. Table III shows a GR-S formulation and the cured properties.

Methyl Zimate at concentrations of 0.3 to 0.75 part with 1.25 parts of VA-7 and 2.0 parts of benzothiazyl disulfide will cure nitrile and natural rubbers within 6 to 8 minutes at 310°F. In many cases, the tensile strengths

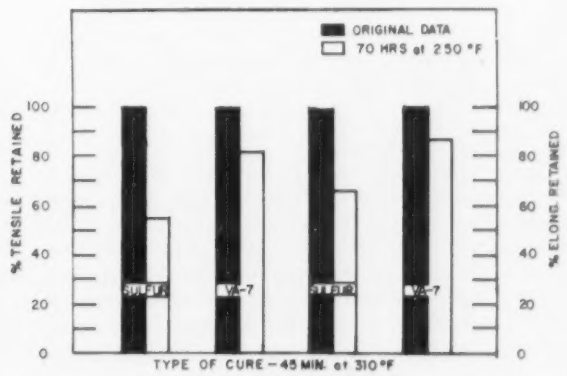


FIG. 4—Heat aging properties of natural rubber tread compounds.

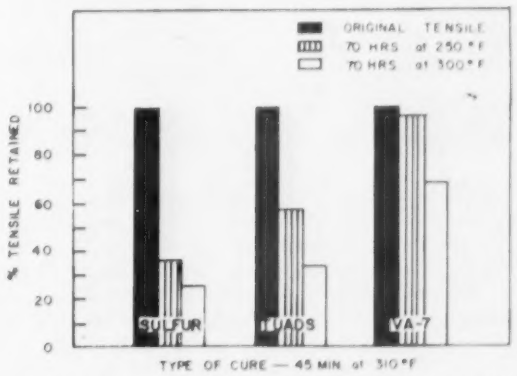


FIG. 5—Heat aging properties of nitrile rubber compounds.

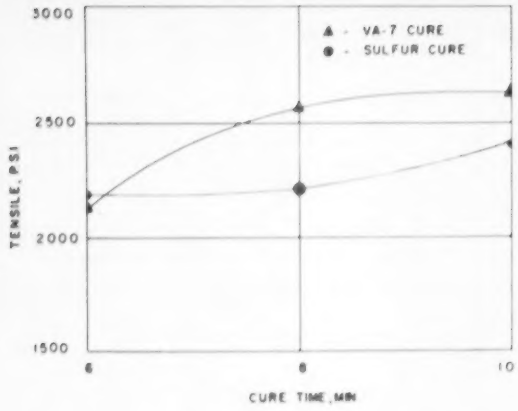


FIG. 6—Heat aging properties of fast curing nitrile rubber compounds.

of these compounds are substantially higher than the sulfur cures. Figure 6 is a plot of the tensile of a VA-7-Methyl Zimate accelerated nitrile rubber compound versus that of a sulfur, Methyl Zimate-Captax cured compound used commercially in the rubber industry.

For industrial applications requiring longer Mooney scorch times, VA-7 may be combined with litharge or benzothiazyl disulfide to give a 4 point Mooney rise of 20 to 40 minutes depending upon the concentration of VA-7 and accelerators.

Retarders

Many formulators require compounds which are fast curing but not scorchy. Normally, VA-7 compounds accelerated with Zimates, Selenac, Ledate and Monex are quite scorchy. Therefore, it is necessary to use a retarder in the compound.

Retarder J (n-nitroso diphenylamine) and Vultrol (n-nitroso diphenylamine) are used with VA-7 in black formulations for producing less scorchy stocks. One part of the retarder per 100 parts of rubber will give a non-scorchy stock. For white formulations E.S.E.N. (phthalic anhydride) is recommended.

It is hoped that vulcanizing agent VA-7 will provide the rubber industry with an accelerator which will be an answer to many of the serious problems encountered due to poor heat aging, bloom and dispersion. Comparatively low amounts of this vulcanizing agent may be combined with accelerators to produce compounds with cures which have original stress-strain and compression set properties equivalent to compounds cured with sulfur and Tuads.

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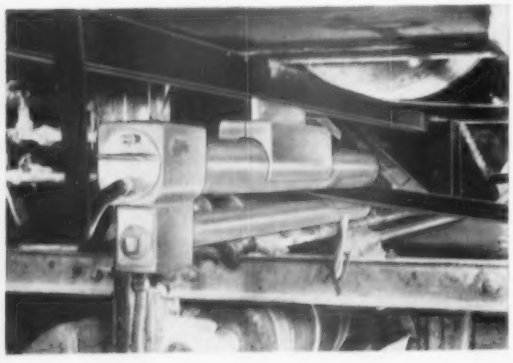
Isotope Non-Contacting Measurer

The Betameter, an instrument employing beta radiation for extremely accurate measurement of mass per unit area of material, has been announced by Isotope Products, Inc., 1700 Niagara St., Buffalo 7, N. Y. Particularly adapted to measurements which cannot be made with conventional equipment because the instrument does not physically contact the measured materials, the



Betameter is used to measure and control sheet thickness, basic weight, coatings, etc., in continuous manufacturing processes.

Fundamentally, the Betameter is designed on the principle that all materials absorb beta rays. The greater the mass, the greater is the absorption and the fewer the number of rays which pass through the material. By measuring the rays which do get through, an accurate measurement of mass per unit area is obtained. In the measurement of sheets with the instrument, a sealed "source" emitting beta rays is mounted on one side of the sheet, a radiation detector on the opposite side. The current generated in the detector is correlated directly with the sheet mass and so with the sheet thickness. Scales can be set up to read in any desired units.

A feature of the Betameter is "null balanced operation," by which the small signal from the detector is balanced against an identical signal from a second source. The difference is amplified to record the amount that the sheet is "off weight" from the desired standards, insuring greater stability and accuracy and also providing a means of continuous standardization. In the accompanying illustration, the Betameter is being used to measure and control roofing material.

Double-Beam Infrared Spectrophotometer

A low-cost double-beam infrared spectrophotometer designed primarily for use by the organic chemist at his bench has been announced by the Instrument Division of the Perkin-Elmer Corporation, Norwalk, Conn. Called the Infracord Spectrophotometer, it may be used for fast purity checks of raw materials, for recording the progress of an organic synthesis, for molecular structure elucidation, and for precise quantitative analysis. Advantages claimed for the instrument are low cost and simplicity of operation. A background in infrared instrumentation is not necessary to use the spectrophotometer, as the operator puts a piece of chart paper on a drum, inserts the sample, and pushes a button, leaving the machine to record a permanent record on notebook-size paper. The instrument is 27½ inches long, 17 inches wide, and 8½ inches high, and weighs 120 pounds. The only service required is a 120 volt, 60 cycle power source.

Editorials . . .

Government Butadiene?

ANYBODY who reads daily newspapers, Sunday newspaper editions, or the weekly and monthly news journals is well aware of the fact that the United States has been plagued by farm product surpluses for many years. Since the economy of the country is closely allied with the prosperity of the farmer, it is not surprising that a great deal of thought has been given to this surplus problem, and rarely a month goes by without publication of some plan designed to alleviate it. These plans range from the practical to the crackpot, from the sublime to the ridiculous, but the problem is still very definitely with us.

The relationship between agricultural products and industrial processes has long been recognized, a relationship generally referred to as chemurgy. Accordingly, it was not surprising that as part of the effort to reduce farm surpluses, President Eisenhower some time ago established the Bipartisan Commission on Increased Industrial Use of Agricultural Products. It is doubtful that many members of the rubber industry paid more than casual attention to the organization and subsequent activities of this commission since, on the surface, there is little relationship between farm operations and the rubber manufacturing industry. That a definite connection is involved has been made evident within the past two weeks.

The facets of this connection are outlined in some detail in the news pages of this issue. Briefly, a trial grain-to-alcohol-to-synthetic rubber program has been incorporated into proposed legislation (S-1741). Specifically, it is designed to put the government back into the synthetic rubber business on an "experimental" basis. As part of its job to find a market for 100,000,000 bushels of government surplus grain annually, the President's Bipartisan Commission, in a special report, has recommended capacity operation of 10 industrial fermentation alcohol plants and two alcohol-butadiene plants for a period of from 12 to 24 months to determine long range costs.

The two alcohol-butadiene plants referred to are, of course, those located at Kobuta and Louisville. The Kobuta unit, which was bought by the Koppers Company in 1955, can be reactivated under government option. The Louisville unit was recently approved by House legislation for sale for the production of chemicals other than butadiene. Both units are capable of producing 196,000 short tons of butadiene (Kobuta, 112,000 tons and Louisville, 84,000 tons) from alcohol, accounting for approximately 68,000,000 bushels of grain a year. This is 68% of the goal sought by the Bipartisan Commission in its quest for disposal of surplus grain. It seems like a fairly simple solution, except that there are the usual ands, ifs and buts.

One of the "buts" associated with this program is the matter of cost and selling price. The chairman of the commission readily admits that it is not possible to arrive at a precise figure for estimating the over-all cost of the proposed alcohol-butadiene program "because of the widely varying estimates received on the cost of producing alcohol and on the return that can be obtained from corn." For this reason, he recommends the two-year trial period. Further, he recognizes the fact that because of competition from synthetic alcohol and alcohol made from blackstrap molasses, grain from the surplus piles would have to be supplied under current market prices. This involves government subsidy, which is defended on the ground that the end cost of the alcohol-butadiene program "would probably be lower than some of the current grain disposal programs." The latter includes foreign sale and barter.

We are in full sympathy with the aims of the President's Bipartisan Commission on Increased Industrial Use of Agricultural Products, since any practical reduction of the nation's farm surplus is of benefit to all of us. But we cannot help feeling that just a little bit of farm lobbying has crept into the recommendations. It is somewhat reminiscent of the proposals made by the Farm Bloc to Bill Jeffers when he first took over the duties as Rubber Director in September, 1942. The pressures at that time concerned the use of alcohol from grain over petroleum for butadiene and the continued use of cotton over rayon for military tires. Although the conditions were different, the situations were similar.

From where we sit there is no basic need for the higher cost alcohol-butadiene. Although the supply of butadiene was somewhat tight in the final quarter of last year, it has eased up somewhat in the first quarter of the current year. Even if there is a sharp increase in butadiene-styrene rubber production in the next few months, incoming additional butadiene capacity should prove sufficient to meet requirements. More important, several surveys indicate that by 1958 the capacity to produce butadiene from petroleum raw materials will exceed the requirements of butadiene for butadiene-styrene rubbers and other butadiene-based products. These surveys visualize production of such rubber at an annual rate of 1,400,000 long tons by the end of 1958.

It took many long years to get the government out of the synthetic rubber manufacturing business. The present Administration is committed to restoration of industry to private enterprise. That's the kind of a program the American people favor. Let's not spoil it by permitting the government to come back into the synthetic rubber field via the feedstock back door.

Highlights Sidelights *of the News . . .*

April, 1957

A plan to utilize 100,000,000 bushels of government grain annually in the production of alcohol and butadiene for domestic consumption has been presented to the Senate Banking Committee . . . The plan, proposed by a Presidential commission concerned with the increased use of agricultural products, calls for capacity operation of ten industrial alcohol fermentation plants and two government alcohol-butadiene plants . . . All the plants would be operated for a twelve to twenty-four month period in order to determine the cost of a long-range program (page 119).

During the next few months, Firestone will complete construction of four new plants at an estimated cost of $30,000,000 . . . This is said to be one of the largest concentrated building programs ever undertaken in the rubber industry . . . The new plants include a butadiene facility at Orange, Texas, a tire plant at Havana, Cuba, an air spring plant at Noblesville., Ind., and another tire plant in Manilla, Philippine Islands . . . The company is also proceeding with extensive expansion, modernization and improvement plans in many of its existing plants (page 121).

Some 800 employees at the Eau Claire, Wisc. and Chicopee Falls, Mass., tire plants of U. S. Rubber were laid off on April 1 "to balance inventories" . . . A U. S. Rubber official said the layoffs were made to parallel the general reduction in the nation's automobile production . . . While there has been no layoff at the company's Detroit, Mich., plant, a reduction in production has been achieved by reducing the work week and adjusting work schedules (page 133).

Goodyear's annual report for 1956 indicated that the firm spent a total of $89,000,000 in capital outlays during the year . . . New plants came into production in the Philippines, Colombia and Venezuela, and plants already in production in England, Luxembourg and Sweden were substantially enlarged . . . A number of domestic facilities were also completed while a new plant in Scotland and a tread rubber plant in Chehalis, Wash., were brought closer to completion (page 119).

From Canada comes news of a major expansion at the Hamilton, Ont., plant of the Firestone Tire & Rubber Co. of Canada, Ltd. . . . Highlights of the new program include the installation of a line of Bag-O-Matics and the construction of a new raw materials receiving and storage building . . . Work on the project is to start immediately (page 142).

Following the successful completion of a fully-integrated "Reclaimator" plant in Buenos Aires, U. S. Rubber Reclaiming Co. has announced plans to make the Reclaimator Process available to companies throughout the world under a license arrangement (page 123).

NEWS REPORTS and Industry Activities

USE OF SURPLUS GRAIN FOR ALCOHOL-BUTADIENE PROPOSED

A plan to utilize 100,000,000 bushels of government grain annually to produce alcohol and butadiene for domestic consumption has been outlined to the Senate Banking Committee under a plan proposed by the President's Bipartisan Commission on Increased Industrial Use of Agricultural Products. The plan calls for capacity operation of ten industrial fermentation alcohol plants and two Government alcohol butadiene plants for a 12 to 24 month period to determine what a long-range program would cost.

The plan also covers the proposal of Publicker Industries, to process 20 to 50 million bushels of corn annually if the government will sell at a price in the neighborhood of 60c a bushel. Publicker would export all its production; the farm commission, however, said there was room in the domestic economy for all of the alcohol and butadiene produced from 100 million bushels of surplus grains yearly.

Some 30 million, it estimated, could go into industrial alcohol until recently supplied by imported blackstrap molasses. Another 70 million could go to the manufacture of butadiene for sale to the producers of synthetic rubber and plastics.

Other Possible Buyers

The commission, headed by J. LeRoy Welsh, also said that if it became necessary some of the program's alcohol production could be supplied to the Defense Department, a large buyer of industrial alcohol, and to the suppliers of alcohol products to the military. Details of the plan were furnished to Sen. J. William Fulbright (Dem., Ark.), chairman of the banking unit considering sale of a government alcohol butadiene plant at Louisville, Ky., to private interests.

Mr. Welsh asked the Fulbright committee to withhold action on the sale legislation pending a Congressional decision, on whether to proceed with the commission's suggested program. A report to the President on all of the commission's activities, including this program, will be filed about June 15.

The Louisville plant is one of two idle government butadiene plants which would be reactivated under the farm surplus proposal; the other, owned by Koppers Co. under government option to reactivate, is located at Kobuta, Penna. The commission estimated they would require 67,900,000 bushels of grain a year to produce butadiene at capacity—84,000 tons at Louisville and 112,000 tons at Kobuta.

"Another 77 to 100 million bushels of grain per year, the commission said, would be consumed by full reactivation of ten privately owned alcohol plants. Total production capacity of these plants, the commission estimated, is 195 to 250 million gallons of alcohol a year.

Because of the widely varying estimates received on the cost of producing alcohol and on the return that can be obtained from corn", the commission said, "it is not possible to arrive at a precise figure for estimating the over-all cost of an alcohol-butadiene program.

"It would seem that accurate costs on an over-all program can be obtained only by carrying on an experimental program for a year or two, using all of the capacity of the idle industrial fermentation alcohol plants, and the alcohol-butadiene units at Louisville and Kobuta."

Nevertheless, Mr. Welsh said the cost would "probably be lower than some of the current grain disposal programs," particularly foreign sale and barter. All plants operated under the program, including government-owned, should be operated by private industry, the commission said.

Reclaimers Revise Specifications

Rubber Reclaimers Association, Inc., New York, N. Y., has announced minor revisions to the Scrap Rubber Specifications which became effective on January 29, 1957. The revisions (1) Eliminate the requirement that foreign scrap shipments be made c.i.f. port of entry; (2) make wire body tires not acceptable unless specified in the purchase contract, and (3) establish a 12-inch cross-section as the upper limit on truck tires acceptable as good delivery. Copies of the Scrap Rubber Specifications are available on request to the secretary of the association, C. T. Jansen, 101 West 31st St., New York 1, N. Y.

An index to Volume 80 of RUBBER AGE will be found on Pages 189 to 192 of this issue.

GOODYEAR REPORTS $89 MILLION IN 1956 CAPITAL EXPENDITURES

The annual report of the Goodyear Tire & Rubber Co., Akron, Ohio, for 1956 shows a capital outlay of $89,000,000 resulting from a world-wide expansion program undertaken by the company last year. New plants came into production in the Philippines, Colombia and Venezuela and plants already in production in England, Luxembourg and Sweden were substantially enlarged. An electronics research building in Litchfield Park, Arizona and a test fleet center in Akron, Ohio, as well as expansions of a number of domestic facilities, were completed while a new plant in Scotland, an aircraft research laboratory in Akron, Ohio and a tread rubber plant in Chehalis, Washington were brought close to completion.

The company expects to begin tire production this year in a new plant now under construction at Glasgow, Scotland, which is expected to maintain and improve participation in the growing overseas markets. Output will also be increased late in 1957 by the expansion of existing plants in Australia, Cuba, South Africa, Mexico and Indonesia.

Goodyear's report shows that last year the company's Atomic Corporation became a fully operating production unit in the nation's atomic energy program. Construction of the gaseous diffusion plant was completed ahead of schedule at a total cost of approximately three quarters of a billion dollars, $400,000,000 less than the original estimated cost of $1,200,000,000.

Increasing Demand Noted

According to the report, the demand for rubber is increasing steadily as a result of increasing population and the constant development of new uses for the material. Plantations in Sumatra, the Philippines and Costa Rica, and a latex creaming plant in Malaya, are maintained to keep pace with the projected demand for rubber. The company also manufactures synthetic rubber in production units in Houston, Texas and Akron, Ohio.

During 1956, concentrated latex, as well as special and standard types of dry rubber were produced at the company's plantations and an 11,000-acre tract in Brazil was steadily developed to assure an adequate supply of locally grown rubber for the new tire plant in the Philippines.

POLYMER CHEMICALS DIVISION OPENS CLIFTON LABORATORIES

The Polymer Chemicals Division of W. R. Grace & Co. officially opened its main offices and laboratories in Clifton, N. J., on March 7 with an open house for members of the press. Visitors toured the offices, application, technical service and research laboratories of the newly formed manufacturing division, and then were feted at luncheon aboard the "Santa Paula", Grace Line cruise ship.

The Polymer Chemicals Division was organized as the seventh chemical division of the Grace organization in March, 1956. The new company unit will manufacture high density linear polyethylene under license from the Phillips Petroleum Co. In February of 1956, the division purchased 150 acres of land in Baton Rouge, La., for the construction of a polyethylene resin plant. Simultaneously, ground was broken for construction of a semi-works plant for the production of experimental quantities of "Grex" resin.

The semi-works plant was completed in July, 1956, and a steady stream of white polyethylene pellets are being shipped to Clifton for quality control studies and customer evaluation. The main plant in Baton Rouge, with an annual capacity of 50 million pounds of resin, is scheduled to be completed by the middle of 1957.

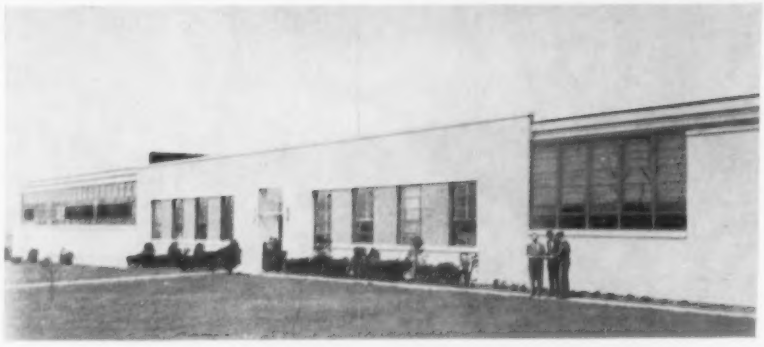
At the formal opening ceremonies of the Clifton laboratories and offices, T. T. Miller, president of the Polymer Chemicals Division, noted that 50% of the plastics fabricators in the country are located in a 300 mile radius from Clifton. He stated that the division is establishing regional sales offices in key centers throughout the country.

General J. E. Hull, U.S.A. (Ret.), president of the Manufacturing Chemists' Association, Inc., also spoke at the opening day ceremonies at Clifton. General Hull spoke of the rapid rise of the plastics industry and noted that more than a dozen firms have entered or are about to enter the polyethylene field.

As for the laboratories at Clifton, they are particularly designed to tackle customer problems. The experimental equipment in Clifton includes injection molding, extrusion and vacuum forming units, as well as packaging machinery. In the months ahead, as experimental runs of high-density polyethylene in Baton Rouge turn into production runs, the laboratories at Clifton will be prepared to render every form of technical sales and service for customers of "Grex" high-density polyethylene resin.

U. S. Rubber Buys Textile Unit

U. S. Rubber Co., New York, N. Y., has purchased the Dixon Mill in South Gastonia, N. C., from American and Efird Mills, Inc. U. S. Rubber will use the 66,000 square foot building for its Textile Division and operations will be started on a modest scale in the near future, gradually increasing as necessary. The Dixon Mill was purchased to expand the company's textile operations. Modifications will be made to both building and property before operations begin. Terms of the transaction were not disclosed.



The new offices and laboratories of the Polymer Chemical Division of W. R. Grace & Co. are shown above. The building covers 50,000 square feet of space and houses general offices and the research and development laboratories.

Develops Carpet Yarn Adhesive

Alco Oil and Chemical Corp., Philadelphia, Penna., has developed a new splicing compound "Vulcanol Adhesive AL-1005", for joining carpet yarns made from nylon, acetate, acrilan, viscose, cotton and wool. The new compound sets uniformly and quickly, but not so rapidly as to prevent the operator from making a strong, well formed yarn joint, the company says. The adhesive was developed for use with the newer, non-absorbing synthetic fibers, which are difficult to splice because of their inability to destabilize adequately the older types of latex compounds by withdrawing water. Splices made with AL-1005 need not be more than 3/8 inch in length, nor of a diameter exceeding that of the yarn itself. The splices are strong enough to withstand the tensions of various winding, creeling and tufting operations and sufficiently flexible to pass through the needle eye and over the hook at acute angles while the yarn, needles and hooks are in motion, the company says. The material is sold in two parts, to be mixed just prior to use in a wet ratio of 84 parts of one component to 16 parts of the other.

Appointed Interplant Manager

F. J. Reighley, formerly staff assistant, has been appointed manager of the Interplant Department for the Firestone Tire & Rubber Co., Akron, Ohio, succeeding M. E. Ake, who retired on January 1, after more than 45 years with the company. Mr. Reighley will be in charge of coordinating activities of all the company's foreign and domestic plants. Born in Columbus, Ohio, Mr. Reighley attended Ohio State University and was graduated in 1934 with a B. A. degree in accounting. He joined Firestone on June 30, 1941 as Billing Department supervisor in sales accounting at the firm's headquarters office in Akron. In 1942, he was transferred to the Interplant Department as scheduler and expediter and became office supervisor in 1944. He was named staff assistant in 1946. Mr. Reighley is a member of Beta Alpha Psi and Delta Sigma Pi.

Have some changes in the information submitted for the 1957-58 RUBBER RED BOOK? Write us today!

Thermoid Increases Directors

The board of directors of Thermoid Co., Trenton, N. J., voted on March 27 to change the by-laws of the corporation, increasing the membership of the board from nine to fifteen. Added to the board were: Rear Admiral John J. Bergen, USNR, Irving Mitchell Felt, Edwin M. Ost, Jr., A. Charles Schwartz, A. M. Sonnabend and Charles Wohlstetter. Rear Admiral Bergen is chairman of the boards of directors of Graham-Paige Corp. and Hotel Corp. of America. Mr. Felt is president of Graham-Paige Corp. and chairman of the executive committee of Hotel Corp. of America. Mr. Ost is vice-president and treasurer of Graham-Paige Corp. Mr Schwartz is a partner in the investment banking firm of Bache & Co. Mr. Sonnabend is president of Hotel Corp. of America, chairman of the board of directors and president of Botany Mills, Inc., and president of Sonnabend Associated Properties, Inc. Mr. Wohlstetter is a partner in the firm of Seskis & Wohlstetter, members of the New York Stock Exchange, and chairman of the board of directors of Induction Motors Corp. The board also voted to increase the number of the executive committee to seven. Mr. Bergen, Mr. Felt and Mr. Sonnabend were elected to fill the vacancies. The newly elected directors represent substantial stockholdings in the company.

Drops Silastic Cloth Production

Dow Corning Corp., Midland, Mich., has announced that the company will no longer produce Silastic Type R and RG tape and cloth, a glass cloth coated with semi-vulcanized silicone rubber. Manufacture of the product will be undertaken by Continental Diamond Fibre Division of the Budd Co., Inc., Valparaiso, Ind., Permacel Tape Corp., New Brunswick, N. J. and Quaker Rubber Division of H. K. Porter Co., Philadelphia, Penna. Originally designed to answer the need for resiliant, high temperature cure-in-place insulation for motor coils, the material has found so many new applications that the company feels it can no longer fill the increasing demand for the product. Dow Corning will continue to concentrate on the development and production of raw silicone products.

$30,000,000 BUILDING PROGRAM NEARS COMPLETION BY FIRESTONE

Four new manufacturing plants costing approximately $30,000,000 will be completed by the Firestone Tire & Rubber Co. during the next few months in one of the largest concentrated building programs ever undertaken in the rubber industry. In addition to the new plants under construction, Firestone is going ahead with extensive expansion, modernization and improvement plans in many of its existing plants, according to Harvey S. Firestone, Jr., chairman. The new plants scheduled for completion between now and October are a butadiene manufacturing plant at Orange, Texas; a tire plant at Havana, Cuba; an air spring plant at Noblesville, Indiana; and a tire plant in Manila, Philippine Islands.

The expansion, improvement or modernization plans are under way at Firestone plants at Pottstown, Penna.; Lake Charles, La.; Akron, Ohio; Fall River, Mass.; Los Angeles, Calif., and Des Moines, Iowa, in the United States, and in Brentford, England; Buenos Aires, Argentina and Port Elizabeth, South Africa, overseas. A multimillion dollar expansion program has also been announced for Firestone's Hamilton, Ont. plant and construction of the new facilities is expected to begin immediately.

"This construction and improvement program will put Firestone in a better position than ever before to take advantage of the expanded opportunities for business in the years ahead," Mr. Firestone said. "The expansion program will increase our capacity for the production of synthetic rubber to 230,000 tons a year within the next few months," he added. "This high level capacity for synthetic production plus our facilities for producing natural rubber in Liberia and Brazil marks our company as the world's largest producer of rubber."

New Job Opportunities

Mr. Firestone said the new construction program alone would create employment for more than 1,500 men and women and increase the firm's annual tire building potential by 250,000 units. Expansions in existing plants will provide employment for hundreds of additional persons, increase efficiency, and increase production capacity, according to Mr. Firestone.

The largest new construction project is the plant at Orange, Texas, which will manufacture butadiene for Firestone synthetic plants at Lake Charles and Akron. The multimillion dollar plant was scheduled for completion by April 1. It will have a capacity of 40,000 tons a year. Butane will be shipped into the Texas plant through a network of pipelines from various parts of the state.

Firestone's air spring plant at Noblesville is scheduled for completion by midyear and will go into volume production in July.

Executives of the company expect substantial business volume in the new product to be marketed as "Airide" by Firestone. The springs are designed to replace steel springs in automobiles of the future. They will permit cars to be constructed lower than any automobiles mass produced so far, and give a much softer ride.

DAVOL RUBBER ANNOUNCES PROMOTIONS OF EXECUTIVE PERSONNEL

Richard N. Carr

Richard H. Graham

Several executive promotions have been announced by the Davol Rubber Co. of Providence, R. I. Richard N. Carr has been elected vice-president in charge of production and secretary; Richard H. Graham has been named chief purchasing agent, and George E. Marcroft has been elected assistant secretary. Mr. Carr has been associated with the company for the past thirty years. He was formerly factory manager and assistant secretary of the company. Mr. Graham has been associated with Davol Rubber since June of 1953 and formerly served as assistant purchasing agent. Mr. Marcroft has been with Davol Rubber for approximately ten years. He was elected assistant treasurer in June, 1955.

The Havana plant under construction will begin the production of tires within the next six months. This new plant will help fulfill the desire of the Cuban government for the production of enough tires within that country to satisfy all domestic requirements of car and truck owners.

The Philippine plant located ten miles outside Manila is expected to begin production of tires for passenger cars, trucks and off-the-road vehicles by October. The Philippine plant is the 14th foreign plant to be built by Firestone. It was undertaken to service the 115,000 motor vehicles in the Philippines as well as the thousands of new cars and trucks being assembled and imported annually into the islands.

Receives Goodrich Safety Award

The President's Cup, highest safety award of the B. F. Goodrich Chemical Co., Cleveland, Ohio, has been presented to the company's Experimental Station at Avon Lake, Ohio. This award is given annually to the plant with the lowest injury frequency rate among the chemical company's eight plants. The Experimental Station operated through all of 1956 without a disabling injury. The last lost-time injury occurred in August 1955. Since that time approximately 1,250,000 man-hours have been worked without mishap. This year marked the first time the Experimental Station has won the President's Cup since its establishment seven years ago. Last year, the award was received by the General Chemicals plant at Avon Lake.

An index to Volume 80 of RUBBER AGE will be found on Pages 189 to 192 of this issue.

NBS Test Activities Reviewed

At a recent meeting of the ASTM and ASA Advisory Committees to the National Bureau of Standards in Washington, D. C., the Bureau's testing activities were reviewed and recommendations made as to goals that should be sought in the areas of calibrations, standard samples, test methods, product testing and related service activities. Dr. A. V. Astin, director of NBS, stated the bureau's objective as the development and promotion of the use of those standards of measurement that are needed by science and industry. He also reported that while formerly all fees collected by the Bureau were deposited in the Treasury, Public Law 940 of the 84th Congress permits the Bureau to reimburse cost of services with fees collected. This and other changes in fiscal arrangements provide greater flexibility in meeting the needs for services and have enabled the Bureau to expand its work on standard samples. Following the meeting with the director and members of the Bureau's staff, the Advisory Committees met in a joint executive session and adopted several resolutions on policy and procedure.

Phillips Licenses Tokyo Firm

Phillips Petroleum Co., Bartlesville, Okla., has licensed Showa Denko K. K., Tokyo, Japan, to use the Phillips developed catalytic process for making rigid polyethylenes. The agreement grants Showa Denko exclusive use in Japan of Phillips patents and technical knowledge for the production of these plastics. Phillips has also licensed its polyolefin process to four major U. S. Chemical companies and six leading overseas firms.

SPRING MEETING OF NEW YORK GROUP ADDRESSED BY OGDEN AND PETERS

Approximately 230 members and guests of the New York Rubber Group attended the Annual Spring Meeting held on March 22 at the Henry Hudson Hotel in New York City. The technical portion of the meeting featured the presentation of a paper on "Magnetic Elastomers for Telephone Answering Sets" by Henry Peters (Bell Telephone Labs) and a paper on "Urethane Elastomers" by W. G. Ogden (DuPont).

Following the presentation of the papers there was a cocktail hour and dinner. A program of entertainment during dinner was furnished by Bobby Hackett's Dixieland Sextette. The after-dinner speaker was Raymond Bill, president of Bill Brothers Publishing Corp. Mr. Bill visited the Soviet Union late in 1956 with a group of American businessmen. In reporting on his interesting trip, Mr. Bill exhibited a motion picture and offered his comments on the trip.

It was announced at the meeting that Leonard Komar (Titanium Pigments) has been named chairman of the Educational Committee. It was also announced that as a result of a recent letter ballot it has been decided to sponsor another basic course in rubber technology in the autumn of this year. In addition, the group will sponsor an advanced course in elastomer technology in the spring of next year. The site of the lecture courses and firm dates will be announced at a future time.

Incorporation of the New York Rubber Group is now being considered by a group headed by M. E. Lerner (RUBBER AGE) and including Ralph DeTurk (Whittaker, Clark & Daniels) and Clyde F. Hoover (Pequanoc Rubber).

To Recognize Past Chairmen

Acting on a suggestion by Mr. Lerner, the Executive Committee passed a resolution providing for recognition of past chairmen of the New York Rubber Group by presenting each with a suitable plaque or scroll. A committee consisting of Mr. Lerner and M. A. Minnig (Witco Chemical) is to arrange for suitable scrolls which will be presented at the Fall Meeting of the group.

As for the meeting itself, Mr. Peters, speaking on "Magnetic Elastomers for Telephone Answering Sets," noted that in the field of sound recordings, many present-day applications make use of plastic tapes coated with magnetic red iron oxide. In recently developed Bell System recording and telephone answering devices, Mr. Peters stated, the iron oxide exists as a dispersion in the elastomeric matrix.

During the operation of the equipment, a metal recording head glides over the surface of a magnetic sleeve. An elastomer is preferable for this purpose, the speaker explained, because it permits the head to indent the surface of the sleeve, thereby maintaining better head contact. Many elastomers, including neoprene, butyl, Hycar, Hypalon and blends of Hypalon, were evaluated.

All of them, with the exception of Hypalon, Mr. Peters stated, were unsatisfactory from the standpoint of wear and frictional noise. The use of graphite, wax and silicone oil provides temporary relief but is not a permanent answer. To date, Hypalon appears to be the most promising elastomer in this respect. However, the scorch characteristics of highly loaded Hypalon compounds are relatively poor, especially the lead compounds.

While magnesium vulcanizates require a certain amount of processing care, they are considerably safer than lead compounds. The additional processing difficulty encountered with lead compounds has been found to be justified for magnetic bands since the lead compounds are affected by humidity to a much lesser extent than the magnesium compounds.

The investigations discussed by Mr. Peters covered the physical, chemical and magnetic properties of many compounds. The output signal, the signal-to-noise ratio, and frequency response were all shown to be a function of the volume loading and dispersion of the oxide. Mr. Peter's paper was prepared in association with W. R. Goehner and W. H. Lockwood of the Bell Telephone Laboratories.

Discusses Urethane Elastomers

In his paper on "Urethane Elastomers," Mr. Ogden first noted that the newest member in the family of elastomer systems is the polyurethane. From the standpoint of basic chemistry, he said, urethane elastomers are radical departures from the classical addition types of elastomeric materials. Mr. Ogden explained that they are condensation products of diisocyanates and diols, and that this system is adaptable to a great many variations. A large number of urethane products have already appeared, Mr. Ogden observed, and it is expected that many more will follow.

The speaker disclosed that the DuPont organization has under development a new polyurethane elastomer, "Adiprene C", which can be cured with sulfur and conventional accelerators. Earlier polyurethane elastomers, including Adiprene B, DuPont's first polyurethane elastomer, are cross-linked by means of diisocyanates. This type of vulcanization system presents difficulties with respect to control. However, these difficulties have been overcome with the sulfur curable type of urethane elastomer.

"So you've made the biggest tire in the world—now what'll we do with it?"

Adiprene C, he said, can be processed and cured with little deviation from methods common to natural rubber and GR-S type rubber. Greatly improved processing, storage stability, and thermal stability are a result of the change from the conventional diisocyanate curing systems. In contrast to self-reinforcing polyurethanes such as Adiprene B, Adiprene C has relatively low gum strength, but is strongly reinforced by fillers, particularly carbon blacks. Compounding techniques used with Adiprene C do not differ greatly from those used with GR-S type rubbers and natural rubber.

Mr. Ogden stated that Adiprene C vulcanizates have a good balance of properties. Outstanding abrasion resistance together with resistance to crystallization, good heat aging, resistance to ozone, oxygen and oil, suggests wide utility for the material in the elastomer field, he said. Mr. Ogden predicted that the outstanding properties of the polyurethanes will prove of great value to the rubber industry and that within the next few years they will constitute a substantial volume of the synthetic rubber market.

Eagle-Picher Buys Gora-Lee

Eagle-Picher Co., Cincinnati, Ohio, has purchased all of the assets, including patents, of the Gora-Lee Corp., operations of which will become part of the Ohio Rubber Co. Division. Gora-Lee, at its Stratford, Conn., plant, produces bibb washers, tack bumpers, screw washers, nail washers, "O" rings, and other rubber products. It has patents on an automatic molding machine capable of producing a wide variety of high-precision molded rubber parts. Ohio Rubber Co., in 1953, entered into an agreement with Gora-Lee whereby it received exclusive license for use of its molding machines in the United States, with the exception of a few products already under license. It now has several Gora-Lee machines in operation, producing parts for a wide variety of uses in the automotive and other fields. As a result of the Gora-Lee acquisition, Ohio Rubber can manufacture a broader group of products, and it has obtained the services of additional skilled and trained employees with wide experience in automatic molding equipment.

Emulsol Chemical Moves

Emulsol Chemical Corp., Chicago, Ill., has announced the removal of its sales and administrative offices from 59 E. Madison St. in Chicago to larger quarters at 75 E. Wacker Drive. The new telephone number will be Financial 6-2960.

U.S. RUBBER RECLAIMING TO LICENSE RECLAIMATOR PROCESS

Following the successful completion of a fully-integrated Reclaimator plant for Fabrica Argentina de Alpargatas in Buenos Aires, Argentina, the U.S. Rubber Reclaiming Co. of Buffalo, N. Y., has announced that it will now make its "Reclaimator Process" available to companies throughout the world. Operating under license from U. S. Rubber Reclaiming, the new Buenos Aires plant is capable of reclaiming rubber in twenty-four minutes instead of the twenty-four hours previously required.

The Reclaimator Process was developed by U. S. Rubber Reclaiming during World War II in an attempt to find a continuous process for the reclaiming of rubber. In 1946, the company achieved its aim and the Reclaimator Process was granted a patent. Not only was the new process fully automated and continuous, but it was capable of producing better reclaims in a much shorter period of time.

Shortly thereafter, the company's $2,500,000 plant at Cheektowaga, N. Y., was completed. After five years of successful operation, the decision was reached to license, supervise and test a similar operation outside the United States. Alpargatas, Argentina's largest manufacturer and employer, was one of the first companies to express an interest in the project.

Background of Alpargatas

Established in 1876 for the manufacture of hemp sandals, Alpargatas now produces about 80,000 pairs of these sandals a day. In addition, the firm manufactures products ranging from tire fabrics to leather and rubber footwear.

The Alpargatas Reclaimator plant was designed and engineered by U. S. Rubber Reclaiming chemists and engineers. Much of the machinery and conveying equipment was designed by the Buffalo concern and the drawings sent to Argentina for fabrication. In this way, shipping and import costs were reduced. Other equipment, not available in Argentina, was ordered and shipped from the United States.

Electrical outlets, piping flow diagrams, instrumentation, control panel boards and operational sequences were all engineered by the American company. In addition, U.S. Rubber Reclaiming tested oils and chemicals available in Argentina before starting operations in order to use as many native materials as possible and thus keep imports to a minimum.

By mid-April, 1956, the new Alpargatas plant was about ready to begin production and the instruction and training of employees got under way. W. A. Bird, chief engineer, and B. R. Wendrow, technical director of U.S. Rubber Reclaiming, were assigned to train the native employees and get the plant into production. Within ten days the Messrs. Bird and Wendrow had the entire plant in operation.

The Alpargatas Reclaimator plant was designed in unit fashion and includes a cracker unit and auxiliary equipment with a capacity of 4,000 to 5,000 pounds per hour; separating systems with a capacity of 1,000 to 1,500 pounds per hour; grinding and screening apparatus with a capacity of 1,200 pounds per hour; oil mixing equipment with a capacity of 2,000 pounds per hour; a six-inch Reclaimator with a capacity of 300 pounds per hour, and a single-pass refiner, this latter unit already in Alpargatas' possession.

Shown above is the new Reclaimator plant of the Fabrica Argentina de Alpargatas in Buenos Aires.

With these capacities, the plant was ready for maximum production with only four men per shift. Cracking requires only 3 operator-hours per day, separation a maximum of 8 hours a day, grinding 8 hours a day, while the oil mixing is automatic. The Reclaimator operates 24 hours a day. U.S. Rubber Reclaiming officials note that with the addition of a second Reclaimator, Alpargatas will double its output at one-fifth of the plant cost and will have to add only one employee.

Now that the Alpargatas plant is in operation, the managing director has reported that a second Reclaimator has been ordered. He states that the real advantage of the plant is the assured supply of a high grade, low cost, basic material. In Argentina, there are five tire plants. Their combined production of tires is such that for many years to come the number of tires available for reclaiming will be in excess of the reclaim needs for the country. Hence, scrap tires in Argentina will continue to be an economical commodity. As reclaimed rubber is an important item in the manufacture of footwear, the managing director believes that the new plant is a most attractive investment.

C. H. Peterson, president of U.S. Rubber Reclaiming, advises that since completion of the Alpargatas plant, negotiations for similar licenses have been started with English, French, Belgian, Portuguese, Spanish and Italian interests.

Higgins Joins United Carbon

Walter G. Higgins, II, has been assigned to the New York sales staff of United Carbon Co., Inc., Charleston, West Va. Mr. Higgins recently completed eight months training at the company's carbon black plants and laboratories before assuming the sales post. He attended the University of Maryland and is a management graduate of Seton Hall University.

Any changes in the information submitted for the 1957-58 RUBBER RED BOOK? Write us today!

Washington Hears Wohler

Leonard A. Wohler of the technical management staff of the Firestone Tire & Rubber Co., addressed the March 20 meeting of the Washington Rubber Group held in the Auditorium of the Pepco Building in Washington, D. C. The speaker observed that since the introduction of latex foam rubber about 25 years ago as a means of increasing human comfort, the interest of technologists and the public in the manufacture and properties of this material has never lagged. In the last few years this interest has been further stimulated by the appearance of vinyl and urethane foams. Mr. Wohler went on to discuss latex foam rubber in its historical, technical and manufacturing phases. He exhibited samples and showed slides of factory operations. Mr. Wohler also outlined the properties of the vinyl and urethane foams and discussed the future potentials of each.

Radley Retires From Oakite

Oakite Products, Inc., New York, N. Y., has announced the retirement of Charles F. Radley as director of publicity and member of the board of directors. One of the original directors of the company, Mr. Radley will continue to serve as consultant on advertising, public relations and general management policy. Mr. Radley joined the company in 1917 as editor of Oakite News Service, the firm's external publication. He was elected to the board of directors of Oakite Products, Inc. in 1926, when that company was organized as successor to the original Oakley Chemical Co. Named director of publicity in 1927, Mr. Radley has since been responsible for Oakite's entire industrial advertising program, including trade publications, exhibits, direct mail, literature and printing.

Leach Joins Lloyd Manufacturing

Franklin A. Leach, formerly general sales manager of the Precision Thread Co., Inc., Fall River, Mass., has joined the Lloyd Manufacturing Co., Warwick, R. I. as a member of the Sales Department in the Extruded and Cut Thread Division. From 1938 to 1954, Mr. Leach was employed by various divisions of the Firestone Tire & Rubber Co. and in 1955, he joined Precision Thread.

GOODRICH INSTALLS AUTOMATIC GLOVE DIP UNIT AT RIVERSIDE PLANT

A technician is shown above setting automatic controls as hundreds of rubber surgeon's gloves on handlike forms move past him on conveyors in the new continuous-process unit installed at the Goodrich sundries plant at Riverside, N. J.

A new continuous-process unit capable of turning out more than 12,000 pairs of surgeon's gloves of "unprecedented uniformity" in one day, has been installed and is in operation at the Riverside, N. J., plant of the B. F. Goodrich Industrial Products Co. A. B. Bush, manager of sundries, said the key to uniformity is a new electronically-controlled dipping process "which practically eliminates the possibility of human error." He explained that dipping of the forms into liquid rubber is delicate. "The forms are dipped for only a few seconds," he said, "and unless the immersion is timed to the exact second, the thickness will vary."

The control system, said to be the only one of its kind in the industry, maintains uniformity of thickness by providing uniformity in the time cycle of the dipping process, Mr. Bush said. This eliminates many microscopic defects which in the past have shortened the life of gloves. Rigid in-process and statistical quality controls are maintained in every step of manufacture, Mr. Bush pointed out, and all materials are controlled by highly-trained technicians. Temperature, concentration and specific gravity of the coagulant (into which the forms are first dipped to help the rubber cling evenly) and the liquid rubber are also rigidly controlled, Mr. Bush said. "These controls insure that the gloves are tissue-thin and touch-sensitive and at the same time long lasting."

The gloves are automatically washed, dried and cured and inspected for defects through a statistical quality control method. The installation is the second continuous-process glove unit at the plant.

As the operator pushes the button, automatic controls raise and lower the forms into the latex.

Esso Research Promotions

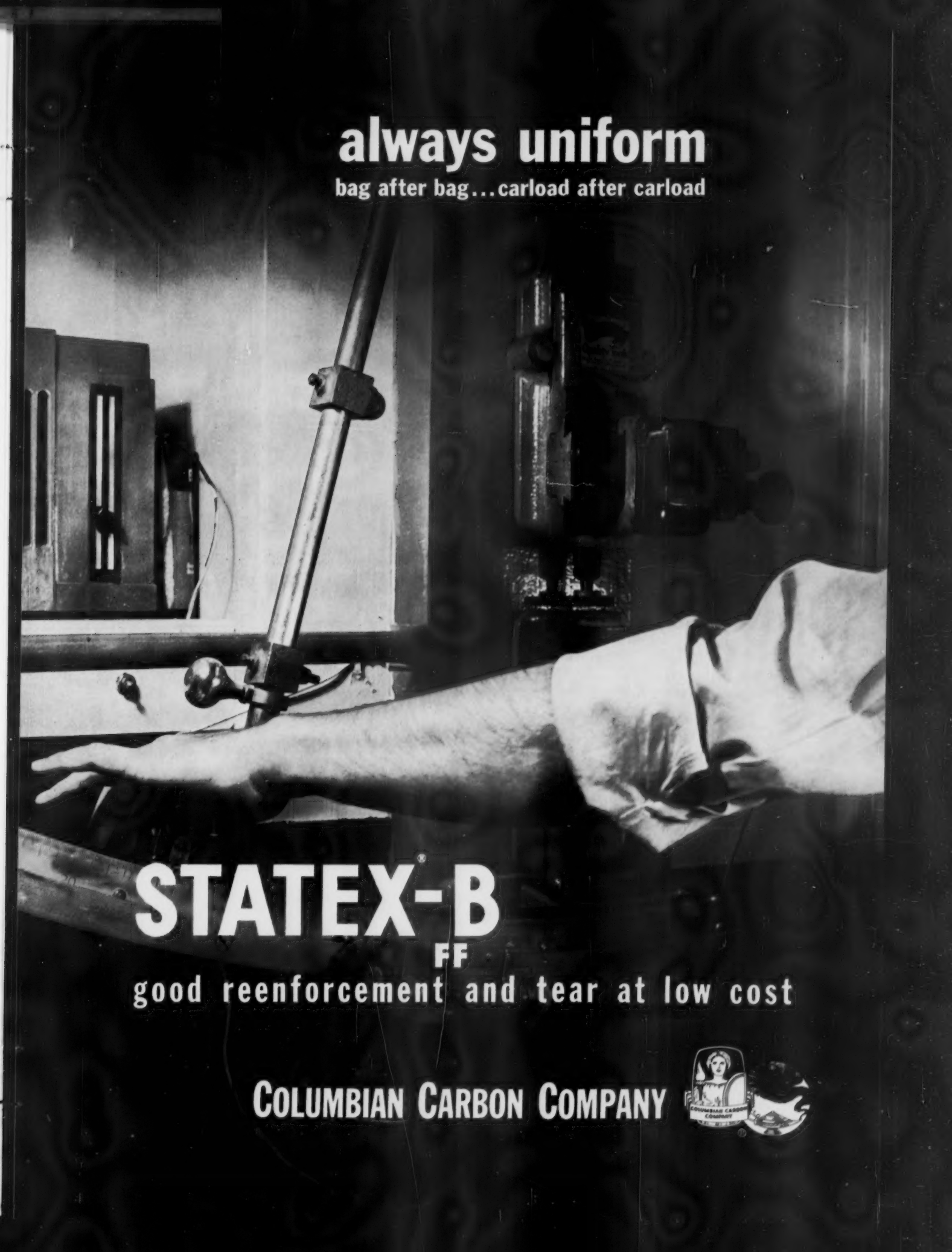
Esso Research and Engineering Co., New York, N. Y., has announced the appointment of Dr. Miller W. Swaney as coordinator of chemicals and Lube Oil processes, succeeding Harold J. Rose, who has been appointed assistant general manager of the Chemical Products Department of Esso Standard Oil Co. Dr. Neil V. Hakala succeeds Dr. Swaney as director of the Products and Research Division, Dr. Leonard E. Moody has been promoted from an assistant director to associate director of that division and Ben W. Geddes has been named as assistant director. Dr. Swaney, previously director of the Products Research Division, will be in charge of all research in the chemicals and lube oil fields. He received a bachelor of science degree in chemical engineering, and his master's degree in chemistry from Vanderbilt University, Nashville, Tenn., and his doctorate from Purdue University, Lafayette, Ind. Associated with Esso Research since 1939, when he started as a research chemist, Dr. Swaney, was a member of the U. S. Government's Rubber Reserve Polymer Research Committee during World War II. Previous positions include that of an assistant director of the Chemicals Research Division and director of the Enjay Laboratories. Dr. Hakala has been associate director since last July. He joined the company in 1943 and was named assistant director of the Products Research Division in 1954.

Institute Sets Safety Mark

A year completely free of lost-time injuries has been observed at the Institute, West Va., plant of Goodrich-Gulf Chemicals, Inc., during its initial year of production. According to Paul W. Cornell, vice-president in charge of production, approximately a half-million man-hours of safe operation have already been recorded at the plant. Brief ceremonies marking the first anniversary of plant operation on February 21 included the raising of a new safety flag in front of the administration building. Goodrich-Gulf officially assumed ownership of the copolymer plant from the government on February 21, 1956. Built during World War II, the plant produced hundreds of thousands of tons of synthetic rubber vital to national defense.

Carbide and Carbon Promotes Dunn

Carbide and Carbon Chemicals Co., New York, N. Y., has announced the appointment of Dr. J. T. Dunn as assistant to Dr. Franklin Johnston, director of research. Dr. Dunn received B. S. and M. S. degrees in chemistry from the University of Wichita in 1932 and 1933. He completed graduate work in organic chemistry at Harvard University, receiving an A. M. degree in 1936 and a Ph. D. degree in 1937. Dr. Dunn started with Carbide in August 1937 as a research chemist. He has worked in various fields of chemical research emphasizing acetylene chemistry. In 1954, he was promoted to group leader and held this position until his present promotion.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CONNECTICUT WINTER MEETING HEARS HOVEY ON EXTRUSION

The Annual Winter Meeting of the Connecticut Rubber Group held on February 15th at Manero's Restaurant in Orange, Conn., attracted some 210 members and guests. Principal speaker at the meeting was V. M. Hovey (John Royle & Sons) who delivered a paper on "The Past, Present and Future of Rubber Extruders." The speaker observed that extrusion had its beginnings in the United States in 1880 with the introduction of the first tubing machine by John Royle and Sons. The basic design principles laid down at that time are still used on all extruding machines today, although they have been further improved and enlarged, he stated.

The development of various parts of an extruder such as the driving mechanism, thrust bearing construction, feed throat design, cylinder types, screw characteristics and head design was traced and illustrated with slides. Early thrust bearings, for example, consisted simply of a hardened steel point bearing on a center at the end of the stock-screw. Next came the marine type bearings many of which are still in use today. Modern machines are equipped with radial type roller thrust bearings capable of withstanding the high loads imposed by present day extrusion compounds and methods, the speaker went on to explain.

Recalls Early Developments

In the early days, cylinders were of non-extended length, but with the advent of the Western Electric room temperature process cylinders were extended and the extruding machine was made to do the work formerly accomplished by a mill. This process, which utilizes rubber fed at room temperature, is becoming increasingly more popular because of the advantages it offers over the old hot feed method, Mr. Hovey stated.

Screw designs, too, have developed over the years; the number of designs tried probably runs into the hundreds, and no one design can be stated unequivocally to be the final answer for a particular compound, the speaker noted.

In the early days cylinder temperature control was not considered a serious problem but in terms of today's extrusion methods and multitude of compound types, each with its own characteristics, temperature control has become of utmost importance. Modern Royle machines are electrically heated and evaporatively cooled, both phases being controlled automatically through the panel board. Thus the high precision of control required is obtained simply and reliably.

Refinements of head and fixture design, further improvements in stock-screw characteristics and higher extrusion speeds seem to be the most obvious developments for the near future, Mr. Hovey concluded.

FALLS ENGINEERING AND MACHINE ESTABLISHES CUSTOMER SERVICE CENTER

The photograph above shows customers visiting the new Customer Service Center recently established by the Falls Engineering and Machine Co. at its plant in Cuyahoga Falls, Ohio. In order to set up the new center, Falls Engineering obtained a building located near its plant and installed machinery so that actual demonstrations could be made of splitting, cutting, trimming and die cutting of rubber and plastics materials. The Customer Service Center also accommodates customers with written reports on test cuts of sample materials. The center includes offices for service and sales engineers, a reception and a conference room. Samples of materials which have been cut are displayed at the new Falls Customer Service Center.

Appoints Three Product Managers

Silicones Division, Union Carbide and Carbon Corp., New York, N. Y., has announced the appointment of three new product managers. They are: T. F. Hart, product manager of silicone resins and sizings; M. H. Jellinek, product manager of silicone specialties, and R. S. Wishart, Jr., product manager of silicone fluids. Dr. Hart received his B. S. in Chemistry from Jamestown College, Jamestown, N. D., in 1940, his master's in 1942 and Ph.D. in 1943 from the State University of Iowa. He joined Union Carbide in 1943 and began working in the field of silicones in 1948. Dr. Jellinek received his A. B. in 1936 and his A. M. in chemistry in 1942 from Brooklyn College, and his Ph.D. from the Polytechnic Institute of Brooklyn in 1946. He joined Union Carbide at Tonawanda in 1946 and has been engaged in the field of silicones since 1949. Mr. Wishart joined Union Carbide at the Silicones Laboratory at Tonawanda, N. Y. in 1948, after receiving his bachelor's degree in chemical engineering at Rensselear Polytechnic Institute at Troy, N. Y.

Williamson Elected President

F. B. Williamson 3rd has been elected president of the Goodall Rubber Co., Trenton, N. J., succeeding his father, F. B. Williamson, Jr., who was elected chairman. The new president joined Goodall in 1940, was named a vice-president in 1949 and executive vice-president in 1954.

An index to Volume 80 of RUBBER AGE will be found on pages 189 to 192 of this issue.

Firestone Receives Safety Award

The highest award of the National Safety Council has been presented to the Firestone Tire & Rubber Co., Akron, Ohio, in recognition of the firm's outstanding safety record during 1956 in all its 42 plants. The company's world-wide accident frequency rate in 1956 was 1.20, a rate of less than two accidents per 1 million man-hours worked. The accident frequency rate was 61 per cent below the par rate of 3.11 set by the National Safety Council to select recipients of its award, and 75 per cent below the accident rate for the rubber industry. In presenting the Award of Honor to Firestone for the ninth time in 12 years, the National Safety Council pointed out that only two companies in the United States have received the award more frequently on a company-wide basis. In addition to the company-wide award, six Firestone plants received the council's individual Award of Honor, seven plants received the Award of Merit, four received the Certificate of Commendation and one received the President's Letter.

Peruvian Firm Dedicated

B. F. Goodrich Co., Akron, Ohio, has announced the dedication of an associate manufacturing company, the Lima Rubber Co., Lima, Peru. Goodrich, who holds a minority interest in the new South American organization, will supply technical assistance. Rubber from eastern Peru will be used in the company's products. Vincent Griffin, formerly of Akron, is factory manager and Enrique Pardo, Peruvian industrialist, is chairman of the board.

DUPONT ANNOUNCES OPENING OF INDUSTRIAL PRODUCTS RESEARCH LABORATORY

The Textile Fibers Department of E. I. du Pont de Nemours & Co., Inc., opened its Industrial Products Research Laboratory to the press for the first time on February 20 with a day-long program which included the presentation of several interesting papers and a tour of the laboratories.

Dedicated to providing a sound technical base for improvement and diversification in the industrial use of cellulosic and synthetic fibers, DuPont's $2,000,000 Industrial Products Research Laboratory in Newport, near Wilmington, Del., has played a key role in the rapid expansion of industrial markets for man-made fibers. It has contributed much of the basic knowledge leading to the growing use of nylon tire cord and has developed technology for such potentially important products as papers and reinforced plastics made with synthetic fibers.

The laboratory, regarded as one of the world's most completely equipped for broad-scale studies of industrial applications of man-made fibers, has also been responsible for a wide range of contributions in fiber properties, methods of processing, and end product developments.

Operating Area Included

In addition to fully equipped physical testing facilities for fibers and industrial end products, the laboratory includes an operating area in which key steps in manufacture of industrial products can be duplicated. This equipment is used in investigating the role of DuPont fibers in such applications as tire cord, plastics reinforcement, non-woven fabrics and felts, papers, bearings, coated protective coverings, filling materials, and mechanical rubber goods.

DuPont's Textile Fibers Department, which manufactures only the raw fibers—rayon, acetate, nylon, "Orlon" acrylic fiber, "Dacron" polyester fiber, and "Teflon" tetrafluoroethylene fiber established the laboratory late in 1954. It serves as the second arm of the Textile and Industrial Products Research Division, carrying out major research functions in relationship with the department's merchandising and technical service organizations, fundamental research laboratories, and manufacturing plants.

These functions are: (1) To develop new end-use technologies meeting needs expressed by present and potential users of DuPont fibers; (2) through creative research, to develop new concepts of fiber utilization for evaluation by industry; (3) to evaluate new or modified fibers developed in DuPont's basic research laboratories from the aspect of applicability to present or potential industrial end uses; (4) to define objectives for basic research in meeting industrial needs for new or modified fibers, and (5) to evaluate modifications in existing fibers resulting from manufacturing improvements or changes in physical properties such as diameter, cross-section, or tenacity.

To carry out these programs, the laboratory has a force of 160, of whom 40 are technical experts. The remainder are technicians, operators, clerical aides, and service personnel. The laboratory operates on a two-shift basis for a total of 16 hours per day, five days a week. The building housing the laboratory has floor space of approximately 40,000 square feet, including offices, physical test laboratories, and operating areas for the production and testing of industrial end products.

Equipment available in the test laboratories includes versatile Instron testers with capacities varying from 10,000 pounds of thrust or tension to measurement of tenacity of individual fibers calculated in a few grams. In addition to a full complement of instruments common to most properly equipped fiber research laboratories, specialized test equipment is available. An example is a special device for simulating the flexing action that cord undergoes in a tire. This novel unit determines fatigue resistance of tire cord by recording the number of twists sustained by a short length of hose reinforced with the cord before it ruptures and allows escape of air compressed within it.

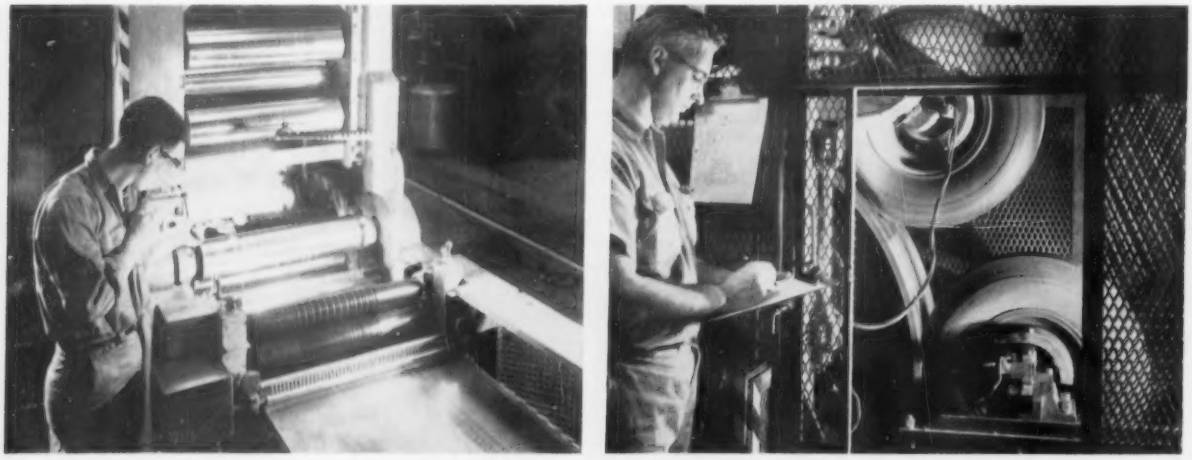
In the operating areas, production equipment is available for every step of tire construction from basic fiber and rubber to finished tires. Determination of the most effective technology requires frequent duplication of the various phases of tire manufacture, and up to 45 test tires per week are turned out under laboratory control. None of these tires are ever sold but are used exclusively in testing and analysis.

An Instron tester, capable of exerting force of 10,000 pounds, is used to determine carcass strength and record exact force required to push plunger through wall of fully inflated tire.

Tire Building Facilities

Tire building facilities available in the laboratory include a dip-stretch unit which can process from one to 64 cords at one time in a laboratory-scale replica of the giant units found in commercial plants. With this unit, researchers can vary conditions widely to determine effect on cord or develop improved processes. Chemical compounds which will promote adhesion of rubber can also be studied. Tires built in the laboratory are molded and cured on a standard Bag-O-Matic press.

Each tire is built to test out some new concept of tire construction. Once built they are subjected to all manner of "torture" to find out how good they are. Some may go out on road tests. Others go onto



Cord tension is meticulously checked (left) prior to application of adhesive which further increases tenacity in the $96,000 hot stretching unit at the laboratory. Tires are tested at various loads and inflation pressures on $80,000 test wheel (right) to determine performance characteristics of tire cord under controlled conditions.

the test wheels, giant flywheels against which tires rotate under controlled conditions of temperature, load, angle, or impact. The two specially-devised test wheels can be set up to duplicate any one condition of tire service, but cannot duplicate the all-inclusive wear of actual driving.

Tires can be run at speeds up to 120 miles per hour, under whatever burdens a researcher may choose to impose. One fairly standard wheel test involves starting a tire at 60 miles per hour in a temperature of 100°F., running for two hours, increasing the speed to 75 for an hour, then to 80, to 85, and on up, with an hour of punishment at each level until the tire fails.

A "load" of tremendous proportions may be put on the tire. Tough hooks may be installed which bite into the tire on each revolution of the test wheel, punishing the body until it finally breaks. Special devices can give temperature readings of the tire or even the air inside if desired.

Other tests include pushing a plunger through the tread of a fully inflated tire, measuring on the Instron the pressure required. An interesting feature is that the one-and-one-quarter-inch plunger used for tires with conventional cord will not penetrate tires reinforced with nylon or new "Super Cordura" high tenacity rayon yarn.

After testing, tires are cut into sections, six out of passenger tires, eight out of truck. One is stored as a permanent record; from the others, cord samples are dissected in a definite pattern to show effects of the test on cords on both tire walls and in the various plies.

From information developed in these tests has come technology for improvements in tire cord and tire performance. In addition, cords which are still only laboratory candidates are being evaluated for possible use when the long process of development may have been completed.

Outside Services Utilized

The services of many outside laboratories are used from time to time. For example, one acoustics research program presently is under way at a consulting laboratory to study tire riding-quality and road-noise problems as they relate to the reinforcing material. In addition to facilities housed within the building, the Industrial Products Research Laboratory carries on extensive tire service studies with test fleets in Pennsylvania and Texas, as well as with a number of commercial taxi and truck fleets throughout the country.

Papers presented at the conference included the following:

"Research and Progress in Tire Cord" by John M. Swanson and Donald H. Heckert.

"Papers and Non-woven Fabrics of Synthetic Fibers" by Peter R. Lantos and John R. Emery.

"Plastics Reinforcement with Synthetic Fibers" by John T. Maynard and Wilmer E. Hansen.

"'Teflon' Tetrafluoroethylene Fiber" by William O. Hofmann.

"Synthetic Fiber Felts" by Herbert G. Lauterbach.

"Coated Nylon Protective Coverings" by Robert J. Scheetz.

IMPROVED VERSION OF GOODYEAR INFLATOPLANE REACHES TEST STAGE

Goodyear Aircraft Corp., Akron, Ohio, has developed a new streamlined version of an inflatable rubber airplane, which was introduced by the company early last year. The craft, built for the Office of Naval Research, features an enclosed cockpit, one-piece wing and simplified controls. Called "Inflatoplane", the craft's wing, tail assembly and cockpit are made of Airmat, a product of the Goodyear Tire & Rubber Co., which consists of two walls of rubberized fabric connected by nylon threads. A research vehicle manufactured to test the use of rubberized fabric as a structural material, the plane is powered by a 44 horsepower Nelson engine. Developed by engineer John Phillips, the new version of the Inflatoplane is shown above as it is being prepared for flight by Goodyear test personnel.

General Aniline Promotes Two

Dyestuff and Chemical Division of General Aniline & Film Corp., New York, N. Y., has announced the appointment of Dr. Robert E. Brouillard as assistant manager of the Pigment Division and Emil A. Wich, as manager of the Pigment Technical Department. Dr. Brouillard was graduated from Bates College in 1938 and received his Ph.D. degree from Clark University in 1941. Formerly associated with American Cyanamid Co., Dr. Brouillard joined General Aniline as senior chemist and was made area supervisor for dyes and pigments in 1951. Since 1956, he has been assistant manager of research and development at the company's Linden, N. J., plant. Mr. Wich was graduated from Brooklyn Polytechnic Institute in 1935 and has specialized in pigment applications on the technical staff of General Aniline since 1939. He is a member of the American Chemical Society and the American Society for Testing Materials. During 1956, he was president of the New York Pigment Club.

Goodyear Introduces Pliovic S70

The Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio, has introduced "Pliovic S70", a medium viscosity polyvinyl chloride resin which is expected to find use in the calendering of clear film and sheeting. Processing readily at temperatures that would be marginal or impossible for higher molecular weight resins, Pliovic S70 offers an opportunity for "tempering" high modulus stocks, the company says. Used as a blending resin, it extends the utility of equipment, permitting the production of a greater variety of vinyl products. While the material is not a dry blending resin, its plastic flow characteristics indicate its use in critical molding applications, injection or otherwise. Over a million pounds of this resin have actually been processed with excellent results, the company says.

Poly-Lease Mold Release Agent

Barrett Division of Allied Chemical & Dye Corp., New York, N. Y., has introduced a new mold release or parting agent for use in the production of plastic and rubber molded products. Trade-marked "Poly-Lease 77", the product consists of a solution of low-molecular weight polyethylene in a mixed solvent system. It is supplied in aerosol form using Genetron as the propellant. When hot or cold mold cavities or other objects are sprayed, smooth, relatively hard film forms quickly on the surface providing efficient release with a minimum number of spray applications. This results in faster cycle time, reduction of rejects and lowering of production costs, the company says. Poly-Lease 77 is said to work especially well with such thermosetting plastic and vulcanized compounds as phenolic, phenolic rubber, melamine, urea, polyester, alkyd and rubber. The new parting agent has also proven effective when used with casting or potting of epoxy, phenolic, furane and polyester resins. As the mold release is inert, it offers no finishing or casting difficulties and permits successful electroplating and painting of items formed in polyethylene-treated molds.

Expands Blue Pigment Line

Pigments Division of American Cyanamid Co., New York, N. Y., has increased its line of phthalocyanine blue pigments by the addition of "Cyan Blue Toner XR 55-3760", which was designed primarily for the plastics, rubber and floor covering industries. The new pigment is said to provide ease of dispersion and good strength development even under adverse conditions of milling. It has high strength, redness of shade and resistance to heat and light, the company says. Bulking properties of the new pigment include a specific gravity of 1.50, a density of 12.5 pounds per gallon, and a bulking value of 0.080 gallons per pound.

Alco Oil Appointments

Three new staff assignments have been announced by the Alco Oil & Chemical Corp., Philadelphia, Penna. Robert P. Restrepo has been named midwestern states field technical sales representative. Leroy J. Davis, Jr., succeeds Mr. Allan as technical sales representative at the company's Philadelphia headquarters. Mr. Restrepo is a chemical engineering graduate of Villanova University. He joined Alco Oil upon graduation as a chemical operator and in 1951 was named plant superintendent for the company's Philadelphia plant No. 1. Mr. Restrepo is a member of the American Association of Textile Chemists and Colorists, the American Chemical Society, and the Philadelphia and Akron Rubber Groups. In addition to covering the midwestern states, he will be responsible for market development of specialty and new product lines throughout the country.

Mr. Allan is a graduate of Lafayette College and served four years with the U. S. Navy as a member of a combat air crew during World War II. He came to Alco Oil in 1954 as technical sales representative in the Philadelphia office. He belongs to the American Association of Textile Chemists and Colorists, the Philadelphia Rubber Group and Theta Chi. Mr. Davis is a graduate of the University of Pennsylvania and attended Temple University. He was with the U. S. Rubber Co. and James Lees and Sons Co. prior to joining Alco Oil. He is a member of the Philadelphia Rubber Group, the American Chemical Society, the American Association of Textile Chemists and Colorists and Kappa Sigma Society Fraternity.

To Build Cuban Tire Plant

U. S. Rubber Co., New York, N. Y., has announced plans to build a $5 million tire plant in Cuba with a production capacity of 125,000 passenger car and truck tires a year. Construction is scheduled to begin immediately and operations are expected to start early next year. Designed to meet the needs of the Cuban market, the plant will be the largest tire factory in Cuba and will have the latest tire-making equipment. It will be located at Loma de Tierra, about 15 miles east of Havana, on a 15-acre site now partially occupied by the U. S. Rubber footwear plant, which was constructed in 1945. The structures, to be built by a Cuban firm, will consist of a single-story main building with 54,000 square feet of floor area and a two-story building with floor space totalling 25,000 square feet. The Cuban plant will be the rubber company's fifth tire manufacturing operation in Latin America. Other tire plants are located in Mexico, Colombia, Venezuela and Argentina.

Firestone Buys Electric Wheel

Firestone Tire and Rubber Co., Akron, Ohio, has announced that it is acquiring the Electric Wheel Co. of Quincey, Ill., for 112,500 shares of its common stock. This acquisition will expand Firestone's interest in the metal rim producing business.

Esso Research Promotes Sparks

William J. Sparks

Dr. William J. Sparks, co-inventor of butyl rubber, has been appointed by Esso Research and Engineering Co., New York, N. Y., to the new position of scientific advisor. The company said the post was created as part of its long-standing policy of "according recognition and prestige to the abilities and achievements of individual scientists and engineers." Dr. Sparks has been director of the Chemicals Research Division since 1946 and holds more than 100 patents. His responsibilities will include surveys of scientific activities in industry, government, universities, research institutes and professional societies. He will recommend research projects and other courses of action applicable to the work of the company which is the scientific affiliate of Standard Oil Co. (New Jersey). He will be associated with the office of scientific liaison managed by Dr. Cecil L. Brown. The company said that in the future the new position will "enable the company's most distinguished scientists to apply their abilities more broadly than ever before in all phases of the company's technical work."

Dr. Sparks won the 1954 Gold Medal of the American Institute of Chemists. The University of Indiana, where he received his bachelor's in chemistry, last year awarded him its highest alumni honor, the Distinguished Alumni Service Award. He joined the company in 1936. In 1952, Dr. Sparks was appointed vice-chairman of the National Research Council's Division of Chemistry and Chemical Technology and in 1953 was named chairman. During the summer of 1953, he made a tour of European science centers and was head of the U. S. delegation to the International Union of Pure and Applied Chemistry in Stockholm.

Dr. Sparks is active in the American Chemical Society, the American Institute of Chemists, the Society of Chemical Industry, the American Petroleum Institute, the Association of Research Directors, the Armed Forces Chemical Association, the National Farm Chemurgic Council, Alpha Chi Sigma, the Chemists' Club of New York and the Cosmos Club of Washington, D. C.

An index to Volume 80 of RUBBER AGE will be found on Pages 189 to 192 of this issue.

Okie Joins Diamond Alkali

Plastics Division of Diamond Alkali Co., Cleveland, Ohio, has appointed James P. Okie assistant general manager. Formerly manager of economic evaluation in the Development Department for Olin Mathieson Chemical Corp., New York, N. Y., Mr. Okie is a veteran of 24 years' experience in the petroleum refining and chemical processing industries. Mr. Okie attended Princeton University, where he received a B. S. degree in engineering in 1933. That year, he joined Shell Oil Co. at its Norco, La. refinery and subsequently worked in other Shell refineries. From 1945 to 1954, he held various executive positions at Shell Chemical Co. in New York, serving as assistant to the vice-president of marketing and manager of the Industrial Chemical Department from 1950 to 1953. He has been with Olin Mathieson as manager of economic evaluation for the past two years. Mr. Okie is past president and a director of the Stamford Good Government Association in Connecticut, and a member of the American Chemical Society, Commercial Chemical Development Association and the Chemists' Club of New York.

Dow Introduces Silastic 916

Dow Corning Corp., Midland, Mich., has introduced "Silastic 916", said to be the toughest, strongest heat-stable silicone rubber ever developed. According to the company, the new stock combines all the thermal stability and high dielectric properties characteristic of silicone rubber with a mechanical strength and abrasion resistance closely approaching that of conventional organic rubbers. Non-toxic and serviceable at extreme low temperatures, the material is easily processed and can be milled and compounded after shelf-aging almost indefinitely. Suitable for molding, extruding or calendering, Silastic 916 can be hot-air vulcanized and remains firmer in the unvulcanized state. The material has a tensile strength in the range of 1500 psi, tear strength of 200 ppi, elongation of over 500% and durometer from 50 to 60 on the Shore A scale. The useful temperature range of Silastic 916 extends from —130 to over 500°F. The new products shows excellent resistance to compression set and permanent deformation under pressure after prolonged exposure to elevated temperatures, the company states.

Arabs Blacklist General Tire

General Tire & Rubber Co., Akron, Ohio, has been included in the latest list of American firms blacklisted by nine Arab nations for refusing to end their trade with Israel, it has been reported. General Tire has a minority interest in a tire company in Israel, General Tire & Rubber Co. (Israel) Ltd., which it operates. An official of the Akron firm said the boycott was not new as far as General Tire was concerned, and that the company has lived under such conditions ever since the factory was started five years ago. Cars equipped with tires produced by General Tire are not permitted to cross the Egyptian border, the reports state.

Tuthill Elected Vice-President

N. H. Tuthill

Newton H. Tuthill, general manager of the Hard Rubber Division of American Hard Rubber Co., New York, N. Y., has been elected vice-president of the parent company. Mr. Tuthill, who joined American Hard Rubber in 1937, was appointed general manager of the Hard Rubber Division in January 1957 and retains his responsibilities in this office. He was previously executive vice-president and general manager of the Pequanoc Rubber Co., a wholly owned subsidiary. Mr. Tuthill was graduated from Norwich University in 1935 and the Harvard Graduate School of Business Administration in 1937.

Cosden Dedicates Styrene Plant

Cosden Petroleum Corp. and the Badger Manufacturing Co. have dedicated a new plant said to be the world's first facility for the production of styrene by direct recovery of ethylbenzene from gasoline. The $3 million unit had been completed within 13 months. By the end of the first day's run, early in February, product purity was 99.2% and present purity of the product is above specifications for plastic-grade styrene, company spokesmen say. The company expects an annual production of 20 million pounds of styrene. Located in Big Spring, Texas, the unit has four giant distillation towers, each nearly 200 feet tall. In the production of styrene, Cosden starts with a mixed xylene stream from its BTX plant. The ethylbenzene is then separated in the Badger Utrafractionation columns with a critical boiling point differential of 4° between the stream constituents. After separation, the ethylbenzene is converted to styrene utilizing new processing techniques developed by Badger. These include dehydrogenation, recovery, purification. The plant has been running with 100% automation, the company says.

Expanding Acrylonitrile Capacity

Carbide and Carbon Corp., New York, N. Y., has announced plans to double the acrylonitrile production at the company's Institute, West Va., plant by the second quarter of 1958. This expansion results from the demand for acrylic fibers, high impact resins, nitrile rubber and new acrylonitrile derivatives.

Cabot Plans Cab-O-Sil Plant

Cabot Carbon Co., subsidiary of Godfrey L. Cabot, Inc., Boston, Mass., has announced plans for the construction of a new plant at Tuscola, Ill. for the production of "Cab-O-Sil", a silicon oxide pigment. Edward J. Holland, Jr., a member of the Cabot organization for 12 years, will be manager of the new operations, which will employ about fifty persons when completed. Cab-O-Sil is now produced exclusively for Cabot by Degussa of Germany for the North American trade, but the demand has become so great in this country, that the construction of an American plant has become necessary. The new plant will be located on a 75-acre tract, about four miles west of Tuscola, which adjoins the plant sites of the U. S. Industrial Chemical Co. and the National Petro-Chemical Corp. Hydrogen for the operation of the unit will be supplied by the U. S. Industrial Chemical Co., and hydrochloric acid, a by-product of Cab-O-Sil, will be sold to the National Petro-Chemical Corp. Natural gas, available in the vicinity, will be used for process heating. The plant, which will have a capacity of about 100 carloads per year, will be designed so that with minor changes other metallic oxides can also be manufactured.

Offers Course on Elastomers

The University of Akron, Akron, Ohio, has announced that a one-week intensive course entitled "The Chemistry and Physics of Elastomers" will be given for scientists and engineers during the week of June 10 to 15, 1957. The course scheduled is as follows: June 10—Recent Developments in Hevea Latex, Chemistry of Synthetic Rubbers; June 11—Chemistry of Synthetic Rubbers, (cont'd.); June 12—Physical Behavior of Elastomers: Elasticity Theory; Dynamic Properties; June 13—Physical Behavior of Elastomers: Relaxation; Tear; Abrasion; June 14—Physical Behavior of Elastomers; Tensile Strength; Reinforcement, and June 15—Chemistry of Vulcanization. For further information, write to the Evening and Adult Division of the University of Akron, Akron 4, Ohio, or to Dr. Maurice Morton, Institute of Rubber Research, at the University.

Expands Research Operations

Research operations of the Wilson Rubber Co., Canton, Ohio, have been expanded in another step in the company's accelerated product development program. The new project will be headed by George Lenhart, a veteran of more than 25 years' service with the company. He is a graduate of the University of Akron. Mr. Lenhart will be assisted by Elwyn H. Becker in Wilson Plant 2, and John Yacos in Plant 1. Mr. Becker, also a graduate of the University of Akron, will be responsible for research, development and quality control. Mr. Yacos will work on development and research for the Wilson line of linemen's gloves.

Joins C. P. Hall Sales Staff

R. H. Steiger

R. H. Steiger, formerly associated with the Goodyear Tire and Rubber Co., has been appointed to the sales staff of C. P. Hall Co., Akron, Ohio. Mr. Steiger will work out of the Akron office. He is a graduate of Kansas State University and a native of North Dakota.

Consolidates Two Divisions

Great Lakes Carbon Corp., New York, N. Y., has announced the consolidation of the company's Dicalite and Perlite Divisions into the newly-organized Mining and Mineral Products Division. The Dicalite Division and its Palos Verdes Stone Department and the Perlite Division with its Strata Products Department have been given the status of departments in the new division. The four groups have been merged in order to achieve maximum efficiency and economy of operation. D. Loring Marlett, vice-president of Great Lakes Carbon Corp. and former general manager of the Dicalite and Perlite Divisions, has been named general manager of the Mining and Mineral Products Division. Joseph E. Moran, formerly assistant general manager of the Dicalite Division, has been appointed assistant general manager of the new division. Administrative headquarters will be located at the company's Los Angeles offices.

Minnesota Mining Buys Kel-F

Minnesota Mining and Manufacturing Co., St. Paul, Minn., has purchased the 'Kel-F" chemical manufacturing business from the M. W. Kellogg Co., New York, N. Y., a subsidiary of Pullman Inc. Officials of Minnesota Mining stated that negotiations have been completed for the firm to take over Kel-F manufacturing facilities adjacent to Kellogg's Jersey City, N. J. steel fabricating plant and research laboratories. The purchase has been made primarily to develop additional uses for these high temperature, corrosion resistant resins, particularly within the chemical fields and for pharmaceutical packaging. The Kellogg firm said that this sale would have no effect on its petroleum and petrochemical research laboratories and other Kellogg manufacturing activities in Jersey City.

Names in the News

George W. Horan, associated with the Minnesota Mining and Manufacturing Co. since 1947, has been promoted to superintendent of tape production at the company's plant in Bedford Park, Ill.

J. H. Bowman, formerly district manager in Dallas for the Firestone Tire & Rubber Co., has been named to succeed J. E. Davis as southwest division manager.

Robert M. Schlemmer, previously manager of the Akron Union Relations Department for the B. F. Goodrich Co., has been appointed manager of the Employee Service Department.

F. J. Carter, vice-president in charge of industrial relations for Goodyear Tire & Rubber Co., has been presented with a service medal commemorating 35 years of continuous service with the firm.

L. M. Thul has been promoted to automotive manufacturing trades sales manager of the Coated Abrasives Division for Minnesota Mining and Manufacturing Co., while Donald J. Scholten has been named central region sales supervisor and Ellsworth W. Erickson, assistant superintendent of factory quality control.

A. T. Callas has been appointed a technical representative for the Surface Coatings Division of the Bakelite Co. in the Detroit district office.

A. N. Wohlwend, director of commercial development of Escambia Chemical Corp., has been appointed vice-president.

Morris A. Dannenbring, formerly assistant manager of the shareholders division for the Goodyear Tire & Rubber Co., has been appointed manager of the division succeeding E. R. Parsons, who retired on February 1, following 38 years' service with the firm.

Walter Donner has been named assistant director of research and engineering for laboratory instrumentation for Beckman Instruments, Inc., and will also continue as chief project engineer for the division's gas analyzer group.

Philip Bergh, associated with the U. S. Rubber Co. since 1934, has been named advertising and sales promotion manager of the company's Textile Division.

Lawrence De Giso has been appointed a sales representative in the Chicago area for Lewis-Shepard Products, Inc., Watertown, Mass.

Neal L. Irwin, formerly manager of Employee Services for B. F. Goodrich, has been named Union Relations Representative.

E. W. Vaill, formerly molding materials technical representative in the New England area for the Bakelite Co., has been appointed technical service engineer of the Molding Materials Division.

George H. Callum has been named general sales manager of manufacturers' products for the Footwear and General Products Division of the U. S. Rubber Co. William J. Mulvey succeeds Mr. Callum as sales manager of Naugahyde vinyl coated fabrics.

Jay B. Harris, formerly sales manager of the Special Division of the Wooster Rubber Co., has been promoted to houseware sales manager.

Gunner M. Oleson has been appointed controller for Linear, Inc., succeeding Thomas H. Hopely, who recently resigned.

J. R. Jones, associated with the Goodyear Tire & Rubber Co. for more than nine years, has joined the Auto Tire Sales Department of the firm.

William B. Richardson, manager of the New England Division for the American Mineral Spirits Co., was presented with a gold watch and a diamond service award at a recent banquet commemorating his 25th anniversary with the firm.

Joseph L. Pert, associated with U. S. Rubber since 1951, has been appointed sales manager of vinyl coated fabrics at the company's Mishawaka, Ind., plant.

W. E. Greene, chairman of the board of the W. E. Greene Corp., has been appointed chairman of the Rubber Division for the New York City Cancer Committee's 1957 April Cancer Crusade.

Wyatt Schoonmaker, sales manager of the Middle Atlantic District for Titanium Pigment Corp., has been awarded a gold watch in recognition of twenty-five years of service.

Kenneth E. Hill, vice-president of the Chase Manhattan Bank, and William T. Golden, chairman of the National-U. S. Radiator Corp., have been elected directors of the United Carbon Co.

Harvey S. Firestone, Jr., has been honored by the West German government for his "outstanding services in furthering friendly relations" between the United States and Germany.

Joseph D. Drohan, formerly acting sales manager, has been appointed sales manager of Eureka fire hose for the U. S Rubber Co.

E. J. Thomas, president of the Goodyear Tire & Rubber Co., has been elected a member of the board of trustees for the American Heritage Foundation.

Erhart K. Drechsel, formerly product manager in the New Product Development Department for American Cyanamid, has joined the Escambia Chemical Corp., where he will be responsible for commercial development activities.

Robert E. Valk, vice-president of the Electric Auto-Lite Co., has been appointed to take charge of the wire and Cable Foundry Divisions, where he will be responsible for the coordination of purchasing, manufacturing, engineering and sales.

Walter W. Kesteloot has been appointed assistant to the president of the Whitney Blake Co., New Haven, Conn.

Lester W. Rice, Jr., who has been associated with the Budget Sales Department of the Goodyear Tire & Rubber Co. since 1954, has been appointed assistant district manager-wholesale at Boston.

William J. Hogg has been appointed sales manager in charge of rubber chemicals and plastics of Naugatuck Chemicals, Division of the Dominion Rubber Co., Ltd.

James D. Evans has been named field representative, with headquarters in New Orleans, La., for the Republic Rubber Division of the Lee Rubber and Tire Corp., while Arden B. Moldstad has been assigned to the company's Boston office in the same capacity.

L. Dean Tyler, manager of the eastern sales district for Mobay Chemical Co., has been named to take charge of the company's new district sales office in New York City.

Wayne E. Burger, treasurer of the Goshen Rubber Co., Inc., has been elected to membership in the Controllers Institute of America.

Philip P. Percich, formerly field representative in the Jacksonville, Fla., area for the Goodyear Tire & Rubber Co., has been appointed assistant manager of the company's Hose Sales Department, succeeding R. E. Mercer, who has been named manager of the department.

Claude O. Stephens, vice-president and general manager of production of the Texas Gulf Sulphur Co., has been elected president, succeeding Fred M. Nelson, who has been named chairman. Mr. Nelson continues as chief executive officer of the company.

Ralph J. Vinciguerra, associated with the Goodyear Tire & Rubber Co. for seven years, has joined the company's Battery Sales Department.

Goodrich-Gulf Promotes Mohaupt

Charles S. Mohaupt

Charles S. Mohaupt, formerly sales representative, has been appointed technical sales service manager for Goodrich-Gulf Chemicals, Inc., Cleveland, Ohio. Mr. Mohaupt, who had been associated with compounding and technical divisions of the B. F. Goodrich Co. in Akron for about 21 years, joined Goodrich-Gulf when it was established in May, 1955. He attended the University of Wisconsin, receiving his bachelor of science degree in 1933. He joined Goodrich at the chemical laboratories in 1934 and after various assignments in factory processing and compounding, became manager of the compounding group for the company's Aeronautical Division. At the time of his transfer to Goodrich-Gulf headquarters in Cleveland, Mr. Mohaupt was serving as technical superintendent of the Aeronautical Division. He is a member of the Division of Rubber Chemistry of the American Chemical Society, the Akron Rubber Group and the American Society for Testing Materials.

DuPont Builds New Laboratory

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced that construction has begun on a fifth laboratory building, which will cost about $5 million, at the company's sales service research center at Chestnut Run, near Wilmington. To be operated jointly by the Pigments and Electrochemicals Departments, the new laboratory will conduct customer service and development work on titanium, silicon, pigments, sodium, peroxygen, chlorine, vinyl and related product fields. The building is expected to be ready for use by the spring of 1958. Construction will be similar to the surrounding buildings of red brick and steel frame and landscaping will conform to standards set for the Chestnut Run area. There will be 81,000 square feet of floor space. The electrochemicals wing will occupy one floor, while the pigments section occupies two. The laboratory will be a center for customer service work, customer visits, development work on new products, new uses for established products, and for training of field personnel. Both departments will transfer operations now carried on at other units to the Chestnut Run area.

LABOR NOTES

U. S. Rubber Co. has announced a layoff of a total of 800 employees at its tire plants at Eau Claire, Wisc., and Chicopee Falls, Mass., effective April 1, "to balance inventories." About 400 workers were furloughed at each plant. Spokesmen for Firestone, Goodyear and Goodrich in Akron said there had been no layoffs by their companies in Akron or out-of-town units.

G. R. Cuthbertson, vice-president and general manager of U. S. Rubber's Tire Division, said the layoffs "parallel the general reduction in the nation's auto production." U. S. Rubber is a major supplier of tires to General Motors. GM's output for the first two months this year trailed 1956 totals by 10.7%.

At Eau Claire, Frank A. Cobb, plant manager, attributed the layoffs to a reduced schedule for production of passenger car tires. The plant, which also makes truck and tractor tires, has 3,400 employees. Mr. Cobb said the plant production is mainly in replacement tires but it also makes original equipment tires for GM plants in the Midwest.

Mr. Cuthbertson said there had been no general layoffs at the company's Detroit tire plant, largest of the five plants operated by U. S. Rubber. "However", he added, "there has been a reduction in tire production (at Detroit) achieved by reducing the work week and adjusting work schedules." U. S. Rubber also has tire plants at Los Angeles and Indianapolis. No layoffs have been made at these plants and none are expected, Mr. Cuthbertson stated.

A new master contract was agreed upon between officials of the Seiberling Rubber Co., and the United Rubber Workers of America, CIO-AFL, on March 25. The agreement, affecting all hourly and production employees in the company's Barberton and Carey, Ohio, plants, expires May 1, 1959. It was signed without a union strike vote, an action often taken during contract negotiations.

The new contract provides additional vacation time, and establishes grievance committee pay, funeral pay, and make-up pay for National Guardsmen and Army Reservists. Employees in the two Seiberling plants affected now will receive three weeks' paid vacation after 11 years' service, and four weeks after 25 years. Paid time for funeral attendance up to three days is established, and make-up pay will be provided those on military duty up to a limit of two weeks. The latest master contract is subject to the approval of the URW international executive board, and it must be ratified by the memberships of the two unions involved.

Installs New Bonding Facilities

H. O. Canfield Co., Bridgeport, Conn., has installed new modern facilities for the bonding of rubber to metal. According to the company, utilization of this method, which will be offered to H. O. Canfield customers, will reflect cost reduction and time savings by eliminating the assembling of metal components to rubber parts on the production line.

U. S. Rubber Promotes Baldwin

Walter D. Baldwin

Walter D. Baldwin has been appointed assistant general manager of the Tire Division of the U. S. Rubber Co., New York, N. Y. Formerly executive assistant to the vice-president and general manager of the division, Mr. Baldwin succeeds John M. Miller, who has retired. Mr. Baldwin started with U. S. Rubber in 1935 as a tire representative at the Spokane, Wash. branch, four years after receiving a bachelor of science degree in business administration from the University of California. He became manager of the Salt Lake City district in 1939 and Portland district manager the following year. In 1944, Mr. Baldwin was placed in charge of sales for the Gillette Tire Division and a year later, he was named sales manager for the U. S. Tire Division. Mr. Baldwin became director of manufacturers sales in 1947 with responsibility for sales of original equipment tires to auto manufacturers.

Purchases General Industrial

Minnesota Rubber & Gasket Co., Minneapolis, Minn., has acquired the assets of General Industrial Products Co., also of Minneapolis, and will operate the firm as a division of Minnesota Rubber. To be known as the Minnesota Latex Rubber Co., the division will include the original company's two plants at 6408 Cambridge St., St. Louis Park and 825 11th Ave., S. E. Production of sprayed, dipped and formed rubber parts will be continued and the "Kotakast" process, a low cost rubber and plastic forming method for industrial and commercial products will be further developed. Walter Craig, president of General Industrial Products, will be general manager of the division. Expansion plans for the division include a new plant, adjacent to the present St. Louis Park facilities, which is expected to be ready for occupancy in April. Sales and administrative offices will be at Minnesota Rubber's headquarters, 3630 Wooddale Ave., Minneapolis 16, Minn.

Want to make a change in the information submitted for the 1957-58 RUBBER RED BOOK? Write us today!

New Navy Specifications

Department of the Navy, Bureau of Ships, Washington 25, D. C., has issued new editions of military specifications and standards. The first, Military Specification MIL-H-19606 (Ships); *Hose and Hose Assemblies, Synthetic Rubber, Reinforced, Water and Oil Resistant, Medium and High Pressure, Nonmagnetic and Regular Service,* was released on December 13, 1956. The specification covers water, fuel, hydraulic, pneumatic and oil hose for shipboard use. Sizes range from 3/16 to 6 inches inside diameter and proof pressures, from 600 to 10,000 psi. A new specification for reusable type hose fittings to be used in conjunction with the above described hose, is dealt with in Military Specification MIL-F-19607 (Ships); *Fittings, Hose, Reusable, Medium and High Pressure.* This specification was issued on January 17, 1957. Both specifications contain a qualification clause, and awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable qualified products list. Manufacturers should have products to be offered to the Federal Government tested for qualification so that they may be eligible for awards of products covered by these specifications. Bureau of Ships visual inspection guides on various rubber products which recently became available as military standards are: Military Standard MIL-STD-289, *Visual Inspection Guide for Rubber Sheet Material;* Military Standard MIL-STD-293, *Visual Inspection Guide for Cellular Rubber Items;* Military Standard MIL-STD-294, *Visual Inspection Guide for Rubber V-Belts.*

Merger Terms Announced

Terms of the merger of Boston Woven Hose & Rubber Co., Cambridge, Mass., into the American Biltrite Rubber Co., have been announced to stockholders of both concerns. One share of Biltrite 6½ per cent of $100 par first preferred stock will be exchanged for each share of Boston Woven Hose 6 per cent $100 par preferred stock. One share of Biltrite cumulative second preferred, 80c dividend, will be issued for each Boston Woven Hose common share. Two-thirds of each class of Boston Woven Hose's stock must be voted in favor of the merger to consummate it. A special stockholders meeting will be held on April 24 to vote on the proposal.

New Bibliographies Available

The Division of Rubber Chemistry of the American Chemical Society, which maintains the Rubber Division Library at the University of Akron, has announced the publication of two new bibliographies. Bibliography No. 26 covers the "Continuous Vulcanization of Extrusions for Wire and Cable," while Bibliography No. 27 is on the "Finishing of Small Molded Rubber Goods." Further information about the bibliographies can be obtained from the Rubber Division Library, University of Akron, Akron 4, Ohio.

Vaughan Joins Dewey and Almy

James L. Vaughan

James L. Vaughan has joined the Dewey and Almy Chemical Co., Cambridge, Mass., as assistant research director in charge of process design and development. In this capacity, Mr. Vaughan will supervise process engineering, the firm's pilot laboratory and part of product development research. Formerly director of process engineering with the National Research Corp., Cambridge, Mass., Mr. Vaughan has also served with Rohm & Haas Co., Shell Chemical Corp. and the Standard Oil Co. (N. J.). For a time, he was associated with the University of Rhode Island as assistant professor of chemical engineering. Mr. Vaughan holds an S. B. and an S. M. in chemical engineering from the Massachusetts Institute of Technology.

Quebec Group Hears Taylor

Sixty members and guests were in attendance at the March 21st meeting of the Quebec Rubber and Plastics Group which was held at the Queen's Hotel in Montreal, Que., Canada. Principal speaker of the meeting was D. M. Taylor, president of the Organic Laboratories, who spoke on "The Role of the Consultant in the Plastics Industry." Mr. Taylor defined a consultant as "one who can make a dollar for his client more cheaply than the client can do it himself." He suggested that much of the consultant's work is devoted to directing available information into the hands of those who are in a position to use it. He emphasized, however, that the important role of the plastics consultant is that of taking on development jobs which the client is not in a position to do. Mr. Taylor, who only recently returned from an extensive trip through Germany, showed many interesting samples of both new and old plastics materials. He described in some detail the progress that is being made in Germany in studying the effects of polypropylene and various rubbers. Mr. Taylor indicated that a new group of important materials will spring from the investigation.

An index to Volume 80 of RUBBER AGE will be found on pages 189 to 192 of this issue.

Fined On Price-Fixing Charges

Six rubber firms fined a total of $145,000 by a Denver Federal Court on price-fixing charges, may appeal the amount of the fines, according to current reports. Indicted by a grand jury last June, the six firms had previously pleaded no contest to federal charges that they conspired in fixing prices on industrial drive belts. Defendants and their fines were: Gates Rubber Co., $30,000; Dayton Rubber Co., $30,000; Goodyear Tire and Rubber Co., $30,000; B. F. Goodrich Co., $25,000; U. S. Rubber Co., $20,000; Boston Woven Hose and Rubber Co., $10,000. District Judge Jean Breitenstein ruled that if the companies appeal the amount of the fines to the 10th Circuit Court of Appeals, the appeal bond of each will be set at the amount of the fine plus $1000. If an appeal is made, it will be grounded on defense claims that the maximum penalty should have been $5000. A revision in the law in 1955 hiked the maximum fine from $5000 to $50,000 on the charges. The rubber companies contend they were accused of price fixing before 1955. Representatives of most or all of the companies attended 24 meetings between 1947 and 1954 at which prices on the belts were discussed, Judge Breitenstein said. He added that he considered the conspiracy extended up until the grand jury indictment last year.

Expands Solvent Facilities

Westvaco Chlor-Alkali Division of the Food Machinery and Chemical Corp., South Charleston, West Va., has undertaken a multi-million dollar expansion of its carbon bisulfide and carbon tetrachloride facilities. The present bisulfide unit, built in 1954 and said to be one of the most advanced in the world, will be substantially expanded and the somewhat older carbon tetrachloride unit will be completely revamped. The solvent expansion program is part of an over-all plan to renovate and enlarge most of Westvaco's South Charleston facilities. Other phases of the program include an entirely new ammonia plant, completed in late 1955, and the rebuilding of the chlorine plant now in progress. Modernization of the steam and power facilities, including installation of modern fly ash equipment, is also under way. The entire rehabilitation program is scheduled for completion in early 1958.

Develops New Blending Process

Columbian Carbon Co., New York, N. Y., has developed a new process for the incorporation of carbon black into rubber which is said to materially enhance the efficiency of carbon black as a reinforcing agent. The process incorporates carbon black into synthetic rubber latex so as to increase the bonding of carbon black to the rubber. A "black rubber" is provided which, when processed into tire tread, will wear appreciably better than those made by conventional dry mixing procedures, the company says. Cooperative tests with tire manufacturers have demonstrated the quality advantage of this new process, Columbian Carbon states.

U. S. Rubber Promotes Van Buskirk

E. C. Van Buskirk

U. S. Rubber Co., New York, N. Y., has announced the appointment of Edward C. Van Buskirk, former assistant development manager, as manager of the Footwear and General Products Division. David D. M. Streed, previously manager of the development laboratories, succeeds Mr. Van Buskirk as assistant development manager of the division. In his new position, Mr. Van Buskirk will be responsible for direction of new product development for the division. He and Mr. Streed are located in the company's Mishawaka, Ind. plant where the division's development laboratories are located. Mr. Van Buskirk started with U. S. Rubber in March, 1941, as a chemist in the company's general laboratories at Passaic, N. J. He served the company in several capacities and in August, 1944, he was transferred to Mishawaka, Ind. He was appointed assistant development manager of the Footwear and General Products Division and put in charge of the divisional laboratories in July 1954. Mr. Streed started with U. S. Rubber in a shell loading plant in Charlotte, N. C. in June, 1953. He was transferred to the Mishawaka plant in 1945 and after several promotions, he was appointed manager of the development laboratories.

Cabot Appointments Announced

Godfrey L. Cabot, Inc., Boston, Mass., has announced several new appointments. H. J. Deery, Jr., who formerly worked in the laboratories as a cooperative student, has been appointed to the Applied Research Section. Dean E. Humphrey, formerly associated with Dewey & Almy, Atlantic Gelatin Co. and Solvent Chemical Co., has been assigned to the Process Design and Economics Section. Edward P. McLaughlin, has joined the Physical Research Section from Avco Research Laboratories. Dr. Adam Orzechowski, previously on the research staff of Allied Chemical and Dye Corp., has joined the Organic Section. Manuel Perdigao, formerly associated with General Electric, has joined the Rubber and Plastics Section. Robert E. Ross, a registered patent attorney, formerly employed by United Carr Fastener, has been named to the patent staff.

Naugatuck Chemical Appointments

Naugatuck Chemical Division of the U. S. Rubber Co., Naugatuck, Conn., has appointed Gerald L. Dennis manager of field sales, and David A. Edwards, plastics technical sales representative in the Akron, Ohio, area. Mr. Dennis, formerly Los Angeles District manager, will supervise the transition of the company's commodity sales organization to a district sales office set-up and then promote sales of all the chemical division products through this district organization. He will make his headquarters at Naugatuck, Conn. A graduate of Nebraska State Teachers and Colorado College of Education, Mr. Dennis joined Naugatuck Chemical in 1942 as a training supervisor at the Kankakee Unit of the Joliet Arsenal in Illinois. In 1945, he was transferred to the main plant in Naugatuck, Conn., as a senior research chemist. He joined the Sales Department in 1947 and was assigned to the Philadelphia area as technical sales representative for latex and latex compounds. In 1952, he was sent to Los Angeles as district manager. Mr. Edwards joined Naugatuck Chemical in 1950 as senior research chemist in the Vinyl Plastics Development Department. In 1954, he became a group leader in the department and in 1955, he was transferred to the sales staff at the division's main plant in Naugatuck, Conn., until he was assigned to the Akron territory. Mr. Edwards obtained a bachelor's and master's degree in chemical engineering from Johns Hopkins University.

Government Seizes Rubber Firm

Rubber Development Co., Mogadore, Ohio, was shut down on March 22 by internal revenue collection agents for nonpayment of back taxes. The plant was reopened after 6 p.m. that evening after partial payment of a $2,910 tax bill. The $2,910 represents withholding tax and social security from Rubber Development employees for the last three-quarters of 1955. With interest and penalty fees, the bill comes to more than $3,100, agents said. The plant was seized shortly before noon, and after partial payment was made, company officials asked that they be allowed to reopen "to make enough money to pay the remainder of the bill". Under formal government seizure, the plant was to have been sold to the highest bidder if the bill was not paid by the required 10-day waiting period.

Taylor Named Division Manager

Eastern States Chemical Corp., Houston, Texas, has named J. Frank Taylor, Chicago Division manager. In this post, he will direct the sales of Eastern States' aromatic, intermediate and aliphatic solvents, distributed throughout the midwest from the company's Chicago Terminal. He will be located at Eastern States Chemical Office in Oak Park, Ill. Previously associated with Commercial Solvents and Federal Color Companies, Mr. Taylor developed a basic patent that is used in the rubber trade. He is past president of the Chicago Rubber Group and a member of the American Chemical Society.

Simonson Joins Thiokol Chemical

A. J. Simonson

Anthony J. Simonson has joined the sales staff of the Thiokol Chemical Corp. of Trenton, N. J., as manager of market development. In this capacity, Mr. Simonson will concentrate on market diversification. Mr. Simonson, associated with the chemical industry for almost twenty years, was assistant general manager of the Borne Chemical Co. of Elizabeth, N. J., from 1953 to 1956. During his career, he has also been associated with the Cook Paint and Varnish Co. of Kansas City, Mo., the City of St. Louis Testing Laboratory, and the Shell Oil Co. A native of Pittsburg, Kansas, Mr. Simonson received his A.B. and M.S. degrees in chemistry from Kansas State University.

Utilizing New Hot Stretch Unit

Dunlop Tire and Rubber Corp., Buffalo, N. Y., has announced the exclusive use of an infra-red nylon hot stretch machine. Designed by Hale & Kullgren, Akron, Ohio, and Dunlop engineers, the machine uniformly tempers nylon cord at a speed never before attainable, the company says. Tempering retards the tendency of the cord to "grow" in service, by pre-setting tire-stretch which eliminates stretching when the tire is in use. Strength and heat resisting qualities of nylon are improved, permitting the manufacture of tires that run cooler, give better mileage and last longer. The nylon cord is stretched under hot, penetrating infra-red lamps by rolls with the ability to produce 10-ton tensions. Maximum stability and strength is acquired, without danger of degradation, as a result of heat setting at extremely low heat exposure time. Dunlop officials say that close electronic control of the entire operation permits the use of tensions and temperatures not possible before.

Retires From U. S. Rubber

U. S. Rubber Co., Akron, Ohio, has announced the retirement of John M. Miller, assistant general manager of the Tire Division since 1950. Mr. Miller became associated with the rubber industry in 1920 and joined U. S. Rubber in 1940. He was manager of the Los Angeles tire plant for seven years. Prior to that, he was assistant factory manager of the Providence, R. I. footwear plant and factory manager of the shell loading plant in Marion, Ohio.

Financial News

U. S. RUBBER 1956 NET INCOME SHOWS DECLINE OF 5 PER CENT

In its annual report to stockholders, the U. S. Rubber Co., New York, N. Y., disclosed that in 1956 the firm's net income was $31,870,013, which is equal to $4.83 a share of common stock, compared with $33,559,494, or $5.14 a share, in 1955. Sales last year totaled $901,260,194, 2.6 per cent below the company's all-time record of $925,593,092 in 1955.

According to the company, the cutback in automotive production combined with higher labor and selling costs were major factors behind a 5 per cent decline in net profits. An increase in foreign business and a greater volume of sales in footwear, conveyor belts, power transmission belting and other industrial products were more than offset by reduced sales of tires, foam rubber, upholstery fabrics and other automotive products, the company says. Nevertheless, profits in 1956 were the third highest in the company's history.

Sales of Dominion Rubber Co. Ltd., the company's Canadian subsidiary, reached a record high in 1956 and foreign business in other countries also increased. The company acquired control of North British Rubber Co. Ltd., in Edinburgh, Scotland, and started construction of two new plants to manufacture Lastex yarn and Lactron thread through affiliated companies in England and France.

Federal and foreign income taxes and the renegotiation of government contracts totaled $29,732,840 in 1956, compared with $36,877,231 in 1955. Net income before provision for taxes and other adjustments was $63,231,064 in 1956 and $83,623,115 in 1955.

Net current assets on December 31, 1956 were $285,788,197, compared with $259,756,641 at the end of 1955. Additions and improvements to property, plant and equipment amounted to $32,514,229 during the year.

The company's West Coast foam rubber plant was doubled in size. Production was also increased for rug underlay, furniture cushioning, golf balls, conveyor belts, hose and battery separators. An expansion of synthetic rubber production facilities at Naugatuck, Conn. was started which will increase the plant's capacity by 30 per cent. Construction of a new plant to manufacture Kralastic plastic materials has been started on a 150-acre tract of land purchased in Baton Rouge, La.

Automatic equipment was installed in tire plants to reduce costs and improve quality. Production of fire hose was modernized, and new equipment added to reduce production costs for rubber roll coverings and collapsible shipping containers.

The company's new research center, which will be the most modern in the industry, will be completed during 1957, it was reported. Twenty-four new products, developed in the company's central research laboratories since 1948, were responsible for $100 million in sales during the year.

Industrial Rayon Corp.

For 1956: Net income of $4,543,719, which is equal to $2.45 per share, compared with $10,681,279, or $5.77 a share, the year before. Sales in 1956 totalled $59,316,290 compared with $83,657,815 in fiscal 1955. According to the company, last year's earnings were adversely affected by market factors including a decline of more than 25 per cent in passenger car production, increased costs incurred in the conversion to the manufacture of a stronger tire yarn and by unsettled tire rayon prices which prevailed during most of the year. Working capital during the year decreased by $874,000 to $39,136,000 at the year-end. Capital expenditures during the year aggregated $3,790,000. Net worth declined by $1,008,000 to $76,097,000, largely as the result of dividend payments which exceeded net income. Expenditures for research were $2,127,000.

Hewitt-Robins, Inc.

For 1956: Net income of $1,362,175, which is equal to $4.26 per common share, compared with $1,282,927, or $4.21 a share, the year before. Sales in 1956 set a new record of $55,454,245, an increase of 18 per cent over $47,132,792 in 1955. Commenting on the year's results, the company said that impressive gains in both sales and earnings were scored by the company's industrial products divisions. These gains were offset, however, by substantially lower sales and losses in some of the consumer product lines.

Thermoid Company

For 1956: Net income of $1,871,632, which is equal to $2.13 a share, compared with $1,614,343, or $1.83 a share, in 1955. Gross sales in 1956 totaled $41,806,585 compared with $40,607,549 in the preceding year. Sales in 1956 were the highest in the company's history. Earnings showed a 16% gain despite reduced production in the automotive industry, which normally accounts for 40% of sales; higher labor and material costs, and extraordinary expenses.

Brunswick-Balke-Collender Co.

For 1956: Net income of $3,364,390, which is equal to $6.15, compared with $1,371,771, or $2.40 (adjusted to reflect the payment of a 5% stock dividend in December, 1956) in 1955. Net sales in 1956 totaled $51,437,258 compared with $38,639,858.

Raybestos-Manhattan, Inc.

For 1956: Net income of $4,108,235, which is equal to $6.54 per share, compared with a 1955 net income of $3,738,497, or $5.95 a share. Sales in 1956 amounted to $84,630,819 compared with $82,905,705 in the preceding year.

Columbian Carbon Co.

For 1956: Net income of $4,834,356, which is equal to $3.00 a share, compared with $6,305,977, or $3.91 the year before. Sales in 1956 totaled a record $65,529,600 compared with $63,781,200 in 1955. The company attributed the profit decline to price weakness in the face of higher production costs. In addition, the company had abnormal write-offs in connection with oil and natural gas exploration and production.

Farrel-Birmingham Co., Inc.

For 1956: Net income of $985,481, which is equal to $3.08 per share, compared with $1,320,386 or $4.13, in the previous year. Sales in 1956 totalled $50,238,519, compared with $37,852,235. Although sales in 1956 were the highest in the company's history, lower margins of profit resulted from unusually large increases in costs on orders manufactured in 1956, which had been booked in 1955 at the then prevailing prices.

Goodall Rubber Co.

For 1956: Net income of $669,289, which is equal to $1.41 per share of common stock, compared with $543,130, or $1.27 per share, in 1955. Sales in 1956 amounted to $12,004,489, compared with $10,320,523 in the previous year. According to the company, a new high in sales and earnings was achieved in 1956. The previous record year was 1955.

Celanese Corp. of America

For 1956: Net income of $16,863,224, which is equal to $2.08 per common share, compared with $15,303,268, or $1.81 a share, in the previous year. Sales in 1956 totalled $188,307,250, compared with $177,502,026 in 1955. Both sales and earnings in 1956 were the highest since 1951.

National Automotive Fibres, Inc.

For 1956: Net loss of $1,821,001, compared with a net profit of $2,164,062, equal to $1.97 a common share, in 1955. Loss for 1956 is after tax carry-back credit and nonrecurring charges; consolidated operating loss before taxes was $1,185,001.

American Enka Corp.

For 1956: Net income of $2,338,088, which is equal to $1.72 a share, compared with $7,070,902 or $5.22 a share, in the previous year. Sales in 1956 amounted to $60,892,199, compared with the record of $71,251,062 established in 1955.

Garlock Packing Co.

For 1956: Net income of $2,292,308, which is equal to $4.64 per share, compared with $1,622,609, or $3.61 a share, in the preceding year. Net income reached a record high in 1956.

Belden Manufacturing Co.

For 1956: Net income of $1,802,322, which is equal to $4.63 a share, compared with $1,582,203, or $4.09 a share, in 1955.

News in Brief

Elected President Of Lee Rubber

A. A. Garthwaite, Jr.

Albert A. Garthwaite, Jr., has been elected president of the Lee Rubber & Tire Corp., Conshohocken, Penna., succeeding his father, A. A. Garthwaite, who has been elected chairman of the board. This latter post had not been filled in recent years. The new president attended Haverford School, Haverford, Penna., and is a graduate of Yale University with a degree in mechanical engineering. Mr. Garthwaite, Sr., has been active in Lee Rubber since its formation in 1915 and has served as director, treasurer and vice-president. He was elected president of the firm in 1939.

Former Thermoid President Fined

Frederick E. Schluter, former board chairman and president of Thermoid Co., Trenton, N. J. received a seven-year suspended sentence on March 26 for allegedly juggling financial records. He was also fined $40,000 and placed on probation for five years. Mr. Schluter and two other company officials had been charged with filing false statements regarding Thermoid with the New York Stock Exchange as well as conspiracy to evade corporation taxes. The three officials interrupted their trial to plead no defense. George S. Fabel, also a former company president, received a suspended sentence and a fine of $25,000 and Robert R. Stevenson, former controller, received a suspended sentence but was not fined. Judge Bicks said he was not imposing a jail term on Mr. Schluter because of Mr. Schluter's poor physical condition. However, as a probation provision, the former executive was ordered to divest himself of all Thermoid stock by April 30.

Ericsson Joins Texas Butadiene

Ralph L. Ericsson has been appointed general sales manager of Texas Butadiene & Chemical Corp., with headquarters at the company's office in Houston, Texas. Formerly vice-president in charge of sales and executive vice-president of Sumner Chemical Co. of New York and Zeeland, Mich., Mr. Ericsson fills a previously vacant position in the organization. He will be responsible for sales, marketing, advertising and for the creation of the staffs to perform these functions.

Michigan Alkali Division of Wyandotte Chemical Corp. has announced the establishment of two new sales offices in the South, the Southeastern District Office at 46 Fifth St., N. E., Atlanta 5, Ga., and the Southwestern District Office at 304 National Bank Building, Baton Rouge, La.

A new illustrated catalog covering the basic types of automatic transverse spray finishing machines produced by the company, has been released by the DeVilbiss Co., Toledo, Ohio.

"PF" canvas shoes, manufactured by the B. F. Goodrich Footwear Co. and Hood Rubber Co., has announced sponsorship of the "Mickey Mouse Club" TV show over 92 stations of the ABC network for a 13-week period.

Irving R. Boody & Co., rubber dealers and importers, have moved their offices to 42 Broadway, New York 4, N. Y.

An illustrated 4-page data sheet published by Leeds & Northrup Co., Philadelphia 30, Penna., presents concise information on the electronic Speedomax G potentiometer instruments which indicate thermocouple temperatures at the flick of a switch on a drum-type scale 25½ inches long.

Servo Corp. of America has appointed Instrument Associates, Arlington, Mass., as the company's sales representative in Maine, Vermont, Massachusetts, New Hampshire, Rhode Island and Connecticut.

American Enka Corp. has moved its offices to 530 Fifth Avenue, New York, N. Y.

Precision Equipment Co., 3714 N. Milwaukee Ave., Chicago 41, Ill., has released a wall chart of conversion factors covering common conversions such as inches to centimeters, watts to H. P., etc.

The Royal Swedish Air Force is equipping a new supersonic jet, the Saab J35 Dragon, with Goodyear tubeless tires, wheels and brakes.

Rowe Methods Inc., 2534 Detroit Ave., Cleveland 13, Ohio, has published a new six-page brochure illustrating and describing its complete line of adjustable powered ramps for loading docks.

Monsanto Unit In Production

A plant for the manufacture of cyclohexylamine (hexahydroaniline) has begun production at the Newport factory of Monsanto Chemicals, Ltd., London, Eng. Part of the plant's output will be used by Monsanto in the manufacture of rubber accelerators and an appreciable volume will be marketed as a chemical intermediate used in the production of resins and wax-emulsion, polishes, paints, petrol, lubricating and cutting oil, etc.

Named Sales Representative

L. A. Anderson

Leverett A. Anderson has been appointed sales representative for Whittaker, Clark & Daniels, Inc. Mr. Anderson will undertake responsibility for the sales of Whittaker products to the plastic and rubber industries in the Ohio territory, with headquarters in Akron.

Proudfit Named Sales Director

Plastics Division of Celanese Corp. of America, New York, N. Y., has appointed Charles W. Proudfit director of sales for the newly created Resin Products Department. He will supervise sales of Celanese® polyester resins and polyvinyl acetate emulsions used in the paint, textile, paper and other industries. Formerly sales manager of the Hormann-Seitz Manufacturing Corp., Newark, N. J., Mr. Proudfit has an extensive background in the sales of vinyl emulsions, polyester resins and drying oil products. Previous to his association with Hormann-Seitz, Mr. Proudfit was a sales representative for polyester resins and vinyl emulsions for the Naugatuck Chemical Division of U. S. Rubber, did market development work on drying oil products for Congoleum-Nairn and was a consultant on Chemical Markets for Frank C. Brown & Co. Mr. Proudfit did both his undergraduate and graduate work at Ohio State University in Columbus. He is a member of the Chemical Marketing Division of the American Chemical Society and the Sales Executives Club of New York.

Marlex 50 Plant On Stream

Phillips Chemical Co., wholly owned subsidiary of Phillips Petroleum Co., Bartlesville, Okla., has announced the beginning of large-scale commercial production of "Marlex 50", a highly versatile, rigid-type polyethylene. Capacity of the Marlex 50 polyethylene plant is scheduled to reach 75 million pounds annually during the last half of the year as additional equipment is placed in operation. An ethylene plant of 180 million pounds initial capacity, which is adjacent to the company's Sweeny Refinery, will supply the basic material through a 75-mile pipe line to the Marlex plant. Underground caverns washed from deep salt formations near Sweeny Refinery will store ethylene.

Krebs Named Research Director

Robert W. Krebs

Dr. Robert W. Krebs has been appointed director of the Chemicals Research Division of Esso Research and Engineering Co., New York, N. Y., succeeding Dr. William J. Sparks, recently named scientific advisor. Dr. Krebs has been associate director of the Esso Research Laboratories in Baton Rouge, La. Dr. Fred W. Banes, formerly acting associate director of the Chemicals Research Division, succeeds Dr. Krebs as associate director. Dr. Krebs joined the Baton Rouge laboratories in 1937, after receiving his doctorate in chemical engineering from the University of Illinois. He advanced to assistant director of the laboratories in 1947 and to associate director in 1954. Dr. Krebs made major contributions to the development of fluid catalytic cracking, butyl rubber, hydrocarbon synthesis and the fluid coking process. He is a past president of the Louisiana Ornithological Society. Dr. Banes, who also received his doctorate from the University of Illinois, joined Esso Research in 1943. He has worked on several phases of high polymer chemistry, separations of hydrocarbons and the development of petrochemical products and processes.

Plan Statistics Research Course

The Institute of Statistics at North Carolina State College will sponsor a one week intensive short course, beginning June 3, on Statistics Methods for Research Workers in Industry and the Physical Sciences. The course, which will be held at Brevard College, Brevard, N. C., will be given in two sections: elementary and advanced. Lectures in the elementary section will cover basic concepts, confidence limits, tests of significance, correlation and curve fitting, analysis of variance and an introduction to design of experiments. To be included in the advanced section will be variance components, multiple regression, response surface methods, experimental design and analysis of organoleptic experiments. There will be a registration fee of $100 and enrollment will be limited to 50 students in each section. For further information, write the Institute of Statistics, North Carolina State College, Box 5457, Raleigh, N. C.

MORE FINANCIAL NEWS

Heyden Newport Chemical Corp.

For 1956: Net income of $2,554,000, which is equal to $1.07. Net sales in 1956 amounted to $46,464,000. The preceding figures represent the combined income and sales of Heyden Chemical Corp. and Newport Industries, Inc., which were merged last year, with Heyden acquiring the assets of Newport. Net income of Heyden Chemical Corp. last year was $1,473,615, which is equal to 96c per share, compared with $1,550,614, or $1.01 in 1955. Sales in 1956 amounted to $24,412,507 compared with $24,656,654 the year before. Net earnings of Newport Industries Inc. in 1956 were $1,106,324, which is equal to $1.43 a share, compared with $1,054,221, or $1.42 a share, the preceding year. Sales of Newport in 1956 totaled $22,051,499, compared with $21,502,233 in 1955.

United Engineering & Foundry Co.

For 1956: Net income of $3,219,712, which is equal to $1.28 per common share, compared with $2,192,608, or $.87 a share, in 1955. Sales in 1956 amounted to $62,696,397, compared with $47,723,198 in 1955.

American Cyanamid Co.

For 1956: Net income of $44,247,158, which is equal to $2.75 a common share, compared with $38,713,666, or $2.50 a share, in 1955. Sales in 1956 amounted to $500,651,279 compared with $451,008,434 in 1955.

Cooper Tire & Rubber Co.

For 1956: Net income of $410,389, which is equal to $1.60 per share, compared with $400,011, or $1.56 a share, in the previous year. Sales in 1956 amounted to $23,737,387 compared with $23,627,594 the year before.

Mills Joins Standard Products

Harry S. Mills has been appointed administrative assistant to the president of the Standard Products Co., Cleveland, Ohio. Mr. Mills, deputy director of the United States Department of Commerce, Washington, D. C., for the past six years, also served three years in the State Department and one year in the Department of Defense. He previously worked in executive capacities with several manufacturing organizations.

Offers New Diisocyanate

"Nacconate 310", dimethyldiphenylmethane diisocyanate, is now available in developmental quantities from the National Aniline Division, Allied Chemical & Dye Corp., New York, N. Y. This new nacconate is unique in that it forms relatively stable water emulsions, has an unusually low reaction rate and low vapor pressure, the company states.

Appointed Research Chemist

John Yacos, Jr.

John Yacos, Jr., formerly principal research chemist at Battelle Memorial Institute, Columbus, Ohio, has been appointed research chemist on the technical staff of the Wilson Rubber Co., Canton, Ohio, a division of Becton, Dickinson & Co. Mr. Yacos will supervise Wilson's research and development program, including the testing of industrial, surgical and household rubber gloves and related products. Mr. Yacos received a bachelor of science degree from Ohio State University in 1950 and a master of education degree from the University of Pittsburgh in 1952. He served with the U. S. Army in the South Pacific and in Europe during World War II, and holds the rank of captain in the Army Military Intelligence. Previous to his association with Battelle, Mr. Yacos was a member of the Weir High School faculty, Weirton, West Va., and a laboratory technician in Columbus. Mr. Yacos is affiliated with the Akron Rubber Group, Foremen's Club of Stark County and the Rubber Division of the American Chemical Society.

Expanding Silicone Department

General Electric Co. has announced the construction of a new product and process development laboratory and further expansion of other facilities of the Silicone Product Department at Waterford, N. Y. Scheduled for completion in January, 1958, the laboratory is part of a $3 million capital outlay planned for the Waterford plant during 1957. In 1956, more than $1 million was expended for additional facilities. The new, two-story research building, to be located adjacent to the original plant site on a 69-acre tract, will provide about double the space now available for laboratories and will be fully equipped for study of all aspects of silicone chemistry. Included will be complete library facilities as well as research equipment. According to the company, the current expansion is part of a planned increase of all department facilities needed for further study and manufacture of silicone products to meet increasing consumer and industrial needs. Other 1957 construction will provide a significant increase in rubber compounding equipment and a substantial boost in manufacturing facilities for various service and utility installations.

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West Coast News

The technical portion of the March 5th meeting of the Los Angeles Rubber Group held at the Statler Hotel in Los Angeles, Calif., featured an address by John M. Ball (Midwest Rubber Reclaiming), on "Compounding Reclaimed Rubber." After a brief description of the five leading methods of manufacturing reclaimed rubber, the important types of reclaim were outlined by the speaker. The analyses of whole tire and butyl reclaims, together with their test recipes and tensile properties were discussed.

Twelve advantages of reclaimed rubber were discussed in some detail: attractive price, stable price, uniformity, short mixing time, low power consumed in mixing, low heat developed in mixing and subsequent processing, fast processing, low thermoplasticity, dimensional stability, fast curing rate, minimizing of reversion, and good aging. The cost of the RHC in whole tire reclaim was shown to be lower than that of the lowest cost synthetic rubber, viz., oil-extended GR-S. The use of reclaimed rubber in conjunction with oil-extended GR-S was recommended, and illustrative data were given.

The SAE-ASTM R Tables were explained, and the use of reclaim with GR-S to give a range of tensiles and volume costs was illustrated. The point was made that volume costs, important as they are, are only part of the cost picture, as processing costs can also be of equal or greater importance. For example, if two compounds have the same tensile properties and volume costs, the one containing reclaim will usually be the less expensive because of its better processing properties.

The talk was concluded with a discussion of the important uses of reclaimed rubber (samples of rubber products were exhibited), and of the consumption of new and reclaimed rubber for each year for the last 10 years.

The appointment of L. D. Maines as a technical representative for the Surface Coatings Division in the Los Angeles district office has been announced by Bakelite Co. In his new assignment, Mr. Maines will be responsible for sales and customer service of all Bakelite vinyl chloride and copolymer, vinyl acetate, vinyl butyral, vinyl ether, polyethylene, phenolic and epoxy resins for surface coatings in the territory that includes Los Angeles and San Diego, Calif.; Salt Lake City and all of Arizona; Albuquerque and all of New Mexico.

Kelco Co. of San Diego, Calif., said to be the world's largest producer of algin products widely used as thickening, suspending, stabilizing, emulsifying, film forming and gel producing agents, has announced the construction of a new $250,000 research laboratory in Research Park, San Diego. "Primary purpose of these new research facilities", said Donald E. Clark, president of Kelco Co., "is to provide advanced technical service in the solution of the product and processing problems of our customers, and to continue our intensive research in the chemistry of algin and its derivatives, as well as on promising new market developments."

James P. (Pete) Gormly, industrial products manager of the Goodyear Tire & Rubber Co., in the Los Angeles district for the past six years, recently was presented with a 25-year service pin. Mr. Gormly joined Goodyear in 1932, after completing his business education at the University of Southern California. After serving in various desk jobs in the Industrial Products Division, he was assigned to San Francisco in 1943 as a field representative and held this position until he received his present assignment.

Clevite Corp. of Cleveland, Ohio, has opened a new West Coast sales office at 4629 Harper Building, Van Nuys Blvd., Van Nuys, Calif. Two of Clevite's manufacturing units will be represented initially. Cleveland Graphite Bronze Co., leading manufacturer of sleeve bearings, bushings and other precision parts will be represented by Joseph Palsulich, appointed West Coast sales manager for the company. Clevite Harris Products, Inc., manufacturer of rubber and metal and rubber parts, will be represented by Henry M. McCarthy.

Appointment of Francis A. Hartney as traffic manager of the Los Angeles plant of the Goodyear Tire & Rubber Co. was recently announced. He succeeds L. W. Young, who retired from the company on April 1. Mr. Hartney first associated with Goodyear in January, 1928, as a traffic clerk in the company's New York office. He remained there until 1942 when he was promoted to chief clerk in the Traffic Division and assigned to Akron.

John D. Beggs, sales manager of the Resin Division, National Starch Products, Inc., has moved to Los Angeles and will continue to coordinate sales, technical and field efforts of this division from the Los Angeles office. Mr. Beggs is widely known in the United States and England for his pioneering work with PVAc systems, as far back as 1939.

Ken French, formerly associated with the Boeing organization at Seattle, Wash., has joined California Rubber Products, Inc. of Hawthorne, Calif., as engineer.

R. W. Johnson, president of Rubber Products, Inc., Gardena, Calif., has announced the merger of the Excel Rubber Co. of Los Angeles with his company. Excel will be operated as a wholly owned subsidiary, primarily engaged in missile applications. Bert Reynolds, former owner of Excel, has been named vice-president and chief chemist of both companies.

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Amoco Plans New Facility

Amoco Chemical Corp., Chicago, Ill., has announced that engineering and construction will start immediately on a chemical manufacturing plant near Joliet, Ill., where a new, unique hydrocarbon oxidation process will be utilized. The plant will be built on a site of about 400 acres, four miles southwest of Joliet on the Des Plaines river, which was selected because of available water, proximity to raw materials, markets and goods transportation. With a capacity of about 60 million pounds annually, the plant will make phthalic anhydride, isophthalic acid, terephthalic acid, dimethyl terephthalate, dimethyl isophthalate, and benzoic acid. The raw material, mixed xylenes, will be obtained from the Standard Oil Co. (Indiana) refinery at Whiting, Ind. The hydrocarbon process enables the production of a diversified line of chemicals at a single plant from one source using petroleum raw materials. Standard Oil Co., parent company of Amoco Chemicals, holds world-wide exclusive right to the process.

International Unit Changes Name

Columbian Carbon Co., New York, N. Y., has announced that Binney & Smith International, Inc., will continue operations under the name of Columbian Carbon International, Inc. This represents a change of name only since the same people will continue to represent Columbian Carbon abroad. The firm will also continue to represent other American manufacturers in the sale of their products.

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Canadian News

An interim statement released to shareholders by the Goodyear Tire & Rubber Co. of Canada, Ltd., reports a wide increase in net earnings in 1956 after all charges. According to the report, consolidated net earnings for the year are $6,222,804, which is equal to $23.06 a common share, compared with $4,397,946, or $15.96 a share in 1955.

Working capital increased by $4,015,645 to $26,428,666 and all requirements for both working capital and property improvements were met from the company's cash resources. The ratio of current assets to liabilities is 4.0 to 1, compared with 3.8 to 1 at the end of 1955. The statement points out that as a result of an increase in inventories of finished goods there has not been any increase in the company's cash balances.

A record in sales was established despite a drop in the production of passenger cars during the year, due to increased demand for Goodyear truck tires, larger unit tire sales in the replacement market and increased sales of industrial rubber products. Sales to export markets were below those of 1955 as a result of currency restrictions, the middle east crisis and the expansion of manufacturing facilities in foreign countries. Capital expenditures during the year totalled $2,924,669 and depreciation provided amounted to $2,512,595.

DuPont of Canada, Ltd., in its annual report, announced a 1956 net income of $4,969,000, which is equal to 67c a common share, 23% lower than $6,493,976 in 1955. Sales amounted to $66,606,100 in 1956, compared with $65,461,474, in the preceding year. According to the company, the net income for 1956 was adversely affected by the price reductions and expenses incurred in connection with its diversification program.

During 1956, average nylon prices were approximately 18 per cent below the levels prevailing at the beginning of 1955, the company stated. An automotive and industrial paints plant at Ajax, Ont. and the "Freon" fluorinated hydrocarbons refrigerant and propellent plant at Maitland, Ont., were brought into production last year and in both cases, the company experienced a period when initial volume was insufficient to operate at a profitable level, the report stated. Operating costs were also affected adversely by other expenses incurred in connection with the diversification program.

Approximately $11,288,000 was spent on construction during the year, represented principally by the explosives plant at North Bay, Ont., and the "Orlon" acrylic fiber plant at Maitland, Ont. This expenditure increased total investment in plants and properties by 17 per cent to $71,375,000 at December 31, on which date $9,850,000 remained unexpended on all projects under construction. A reduction of $7,328,000 in cash and marketable securities stemmed from the rapid rate of new plant construction achieved during the year.

Cryovac Co., Cambridge, Mass., a division of W. R. Grace & Co., has announced that its Canadian company is building a large modern converting plant in Toronto, Canada, to serve the growing demand for the company's products on the Canadian market. This expansion is the first part of an over-all plant organization and expansion program to take place in 1957. The second part of the program calls for the gradual decrease of operations in the company's oldest production unit at Lockport, N. Y., which has been servicing the Canadian market with packaging materials.

The company's present modern production facilities at Simpsonville, S. C. and Cedar Rapids, Iowa, will serve the domestic markets formerly supplied by the Lockport plant. It is expected that the changeover will take several months during which operations at the Lockport plant will be discontinued on a gradual basis pending the completion of the Toronto plant.

Emery Industries, Inc., Cincinnati, Ohio, has undertaken the formation of a wholly-owned subsidiary, Emery Industries (Canada) Ltd., as another step in the company's expansion program. The new Canadian company has acquired the land, buildings, manufacturing facilities and existing fatty acid business of S. F. Lawrason & Co., Ltd., of London, Ont., as of April 1. R. T. Hull, who has been associated with Emery for many years in sales, product management and sales management, has been appointed vice-president and general manager of the Canadian organization.

Installation of new equipment will enable the Canadian branch to produce a complete line of top-quality fatty acids for the Canadian market. Stearic, oleic, animal and vegetable fatty acids and glycerides, lard oils, metal working compounds, textile chemicals and Sanitone dry cleaning compounds will be produced by the new company. F. S. Lawrason & Co., Ltd., under the direction of Walter J. Evans, president, will be retained as exclusive sales agents for all Emery products, except Sanitone, in the Dominion.

Polymer Corp., Sarnia, Ont., has announced that construction will proceed immediately on a new specialty latex plant. This new plant, which will be built to the north of the existing copolymer unit tank farm area, is estimated to cost in excess of one million dollars. It will provide separate facilities for handling, treating, storing and loading rubber latex. The scope and importance of rubber latex has grown tremendously in recent years. Its consumption in Canada has kept pace with the rapid increase in the use of solid rubber, and in one application alone, that of foam sponge, the consumption of latex has more than tripled between 1951 and 1956.

The work force required to staff the new plant will be small. A careful training program will be undertaken beforehand to equip the operators with the special skills and operating techniques necessary to run this new plant. Orders for some of the heavier structural steel shapes were placed several months ago. By placing the orders early, critical months of waiting have been saved. Orders for equipment and tankage will be awarded in the near future. Present plans are to have this unit in operation toward the end of 1957.

A multi-million dollar expansion of production facilities and equipment is expected to start immediately at the Hamilton, Ont., plant of the Firestone Tire & Rubber Co., Canada, Ltd. The expansion will mean a substantial increase in the production of truck, bus and transport tires.

Highlights of the new program will include: Installation of a Bag-O-Matic line for curing heavy duty tires—believed to be the largest of its kind in the Canadian rubber industry, an extensive rearrangement of tire and bead-building equipment, additional mixing mills, and increased Banbury and pelletizing capacities, and a raw materials receiving and storage building to be constructed on the east side of the plant.

President W. H. Funston said the expansion program confirmed the company's faith in the vigorous, expanding Canadian economy and was evidence of the increased demand for heavy duty tires on the highways and on construction projects across the nation.

The present program is the latest in a series of additions and modernization programs since the end of World War II. In 1954, a new addition to the general office was constructed. The last major plant expansion was in 1953, when a new east wing of the tire room was erected. Preparations for the installation of the new equipment are now well under way, Mr. Funston said.

The Licensing Commission of Metropolitan Toronto, Ont., will be asked not to renew the license of the National Rubber Co., Ltd., to operate a plant on Wiltshire Ave., in the city of Toronto. The Board of Control recently decided to make the request after receiving a report from the police chief, fire chief and building commissioner which said the fire record of the plant, and recent fires in similar plants in other communities, indicated they should not be permitted in congested areas. The plant was damaged by a fire on February 10.

Miner Rubber Co., Ltd., has shut down its factory at Granby, Que., for a one-month period starting April 8, leaving nearly 800 employees jobless. A company spokesman said over-production was the cause of the shutdown.

Manhattan Rubber has released a new catalog describing its conveyor and elevator belts as well as its complete line of hot material belts for temperatures from 150° to 350°F. Ask for Catalog 25 CB.

An index to Volume 80 of RUBBER AGE will be found on pages 189 to 192 of this issue.

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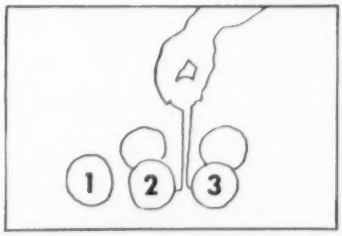

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The Babcock & Wilcox Company

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Opens Fuel Cell Test Unit

The Aviation Products Division of the B. F. Goodrich Co., has undertaken tests of new fuel cell materials and designs, required for advanced military aircraft, at a new $500,000 laboratory located at the company's plant in Los Angeles, Calif. Development of rubber or rubber-like materials and fuel cell constructions that withstand both extremely hot and cold temperatures will be a major goal of the laboratory, the company says. The new laboratory features a "hot and cold room" capable of sustaining temperature ranges down to —85°F. and up to +165°F, which is large enough to test a complete section of an airplane with fuel cells installed. Two other, smaller cold chambers for development testing have temperature ranges down to —100°F. A sublimation chamber will be used to cool test fuel to as low as —100°F. Other equipment includes a "slosh" table, capable of carrying a 30,000 pound load for testing the capacity of fuel cells to withstand surge pressures; a vibration table that vibrates at 2,000 cycles a minute at an amplitude of 1/32-inch; a variety of ozone and flex testers; laboratory ovens and other equipment to evaluate the performance of new materials in the range of 500°F. The laboratory will conduct tests of new constructions and materials to meet military specifications and final qualification tests of fuel cells for specific airplane installations. Fuel storage tanks with a capacity to 50,000 gallons are installed underground to provide sufficient quantities of the several types of fuel required for the tests.

Forms International Division

Witco Chemical Co., New York, N. Y. has announced the formation of an International Division to be operated under the direction of Robert I. Wishnick, chairman of the board. The division will be responsible for the manufacture and sale of all company products outside the United States. All foreign licensing arrangements entered into by the company will also be handled by the new organization. L. D. Carver, who has been appointed manager of technical sales for the newly created division, will be responsible for all technical matters. He will be located in the company's executive offices in New York. Mr. Carver joined Witco ten years ago as technical service director of the Carbon Black Division. Most recently, he has been active in the expansion of Witco's international business.

Reprint Government Publication

A standard reference in the field of weights and measures, *Testing of Weighing Equipment*, National Bureau of Standards Handbook H37, has been reprinted to meet public demand. One of a series of handbooks designed to present concise, comprehensive information related to weights and measures supervision, H37 also describes various types of scales and weights, the principles of their operation and methods for their inspection and test. Priced at $1.25, the 184 pages volume may be ordered from the Government Printing Office, Washington 25, D. C.

Obituaries

Lawrence A. Watts

Lawrence A. Watts, retired district sales manager in the Akron area for Calloway Mills of Georgia, died on March 26 at his home in Akron. Mr. Watts had retired as a representative of the company on December 1, 1954 after 30 years' service. Born in Chicago, Mr. Watts attended school there and at the Evanston Academy and Northwestern University. In 1910, he became a sales representative in the Chicago territory for the Republic Rubber Co. and three years later was sent to Dallas, Tex. as division manager. He was made general purchasing agent for the company at its plant and home offices in 1916. In 1921, when Republic was affected by the slump and went into the hands of a receiver, Mr. Watts was appointed assistant receiver. He held that position until 1923, when the Lee Corp. purchased the company's assets. When he relinquished the assistant receivership, he took over the account of Calloway Mills with headquarters in Akron and sold cotton fabrics, principally to the rubber industry. Mr. Watts was a member of many community organizations.

Charles S. Grainger

Charles S. Grainger, who helped found the Olympic Tyre and Rubber Co. in Australia, died at the Mercy Hospital, Melbourne, Victoria, Australia, on March 3. Mr. Grainger was 64 years old. One of Australia's foremost experts on the design and manufacture of motor tires and electric cables, Mr. Grainger was associated with the rubber industry throughout his business career. When Olympic Tyre was set up in 1933, Mr. Grainger joined the company as chief technical executive. Though he retired from active duty in 1955, he remained a director of Olympic Tyre as well as of the parent company, Olympic Consolidated Industries, Ltd. He was also a director of Olympic Cables Pty. Ltd., and of Olympic General Products Pty. Ltd.

Royal L. Shuman

Royal Lewis Shuman, chemical engineer and president of the former Shuman Chemical Products in Cedar Grove, N. J., died on March 27 in Mountainside Hospital, Montclair, N. J., after a short illness. He was 77 years old. Mr. Shuman is survived by his wife.

Arnold W. Francis

Arnold W. Francis, retired New York City rubber broker, died on March 19 at the Orange Memorial Hospital, Orange, N. J. Mr. Francis served in the Army in Cuba during the Spanish-American War. He is survived by his wife and two daughters.

Constructing Petrochemicals Unit

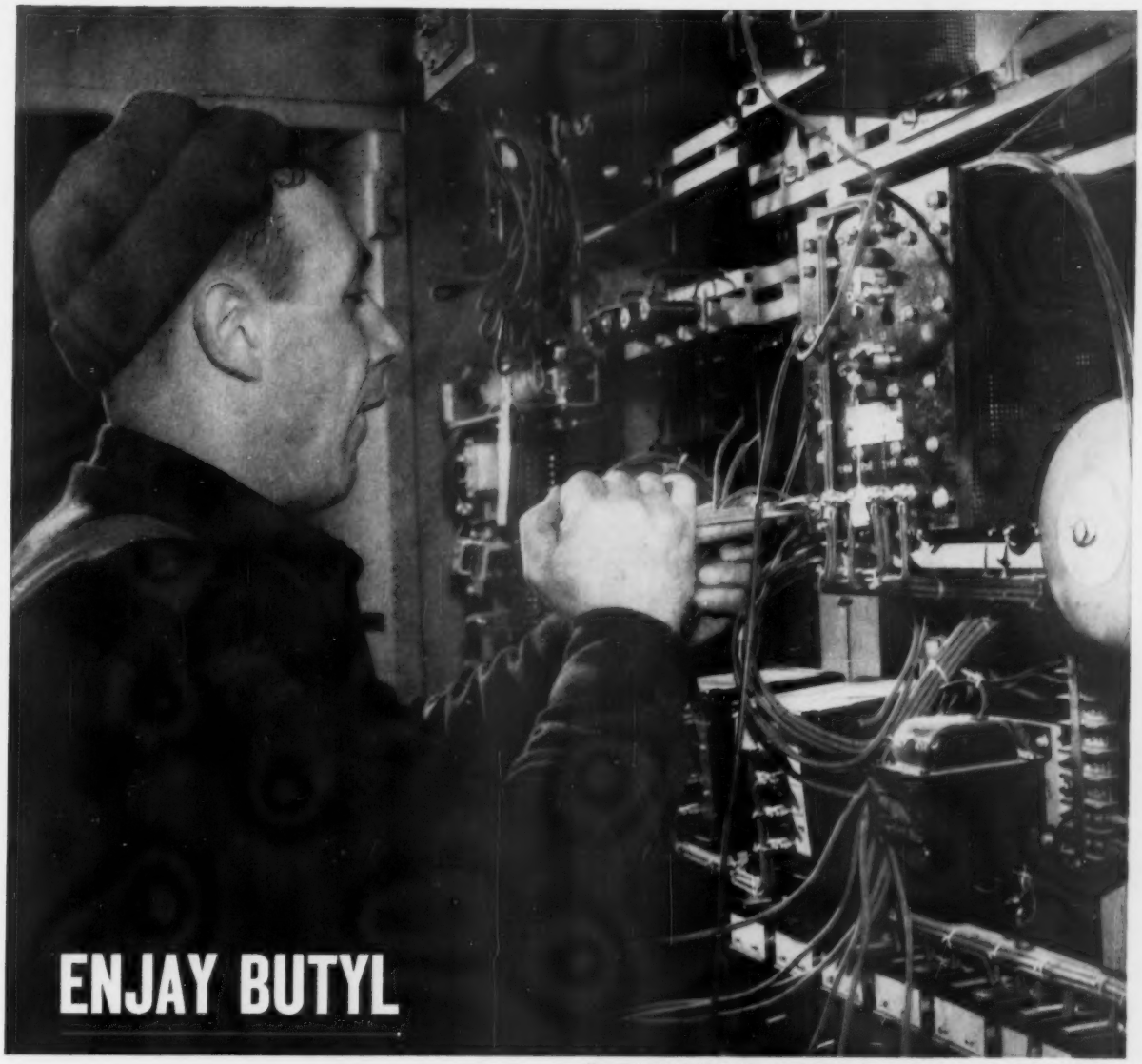
Construction of what is said to be the first petrochemical plant to be built by an oil company in Kansas is now under way at the Potwin, Kansas, refinery of the Vickers Petroleum Co. of Wichita, Kansas. Completion is scheduled for January, 1958. The $2 million petrochemical plant will be an Udex extraction unit, which will remove aromatic hydrocarbons contained in reformate resulting from a million dollar catalytic reformer now under construction at the Potwin refinery. Aromatics that will be manufactured by the Udex extraction unit will include benzene, toluene, xylene and aromatics classified as having nine to eleven carbon atoms. Chemical raw materials derived from Vickers' new petrochemical plant will be used extensively in the production of synthetic rubber, synthetic resins, plastics, medicines, etc., and in certain synthetic fibers used in the manufacture of textiles. Over 15 million gallons of chemicals will be produced annually at the plant. One hundred new tank cars, ordered by Vickers for early 1958 delivery will transport these chemical raw materials to the major consuming areas. The petrochemical plant is the latest move in a Vickers expansion program which began in 1952.

Form New Coating Concern

Formation of a new industrial plastic coating firm, Polykote, Inc., with production facilities and offices at 877 Addison Road, Cleveland 3, Ohio, has been announced by its president, James R. Jones, Jr., and R. W. Renton & Co. Polykote was formed by the purchase of the existing coating facilities of the Renton company with the intention of expanding industrial protective coating services in hot and cold dip plastisol, vinyl sheet linings, epoxy, urethane and neoprene coatings. Associated with Mr. Jones are Bob Renton, president of R. W. Renton & Co., and K. M. Keller, president of Keller Products, Inc., Division of the Macco Chemical Co. Prior to this business venture, Mr. Jones was with the Claremont Pigment Dispersion Corp. and Ferro Corp., having been associated directly with sales and manufacturing as experienced in the plastics industry for the past seven years. He is an individual member of the Society of Plastic Industries and an active member of the Society of Plastic Engineers.

New Goodrich Chemical Plant

B. F. Goodrich Chemical Co., Akron, Ohio, has announced plans for the construction of a $5 million chemicals plant near Henry, Ill. With actual construction scheduled to begin sometime in May, the facility should be completed in early 1958. The plant will produce specialty organic chemicals for use in rubber, plastics, petroleum and other industries. The plant site is served by the Central Illinois Light Co. and the Rock Island railroad. Options on a 240-acre tract on the west bank of the Illinois River have been secured. The initial construction phase will consist of three units: the process building, an office-warehouse and machine shop unit, and a steam generating plant.



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Overseas

By Comtel-Reuter

Moscow—A group of British businessmen have opened negotiations with the Soviet Ministry of Foreign Trade to supply a complete tire factory to the Soviet Union. The group represents seven large British companies who are major suppliers of processing machinery and electrical equipment for the rubber industry. The group hopes to supply Russia with a factory capable of producing a complete range of passenger, truck, bus and tractor tires.

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Kaula Lumpur—Malayan smallholders last year replanted 48,885 acres with rubber for an all-time record, the Rubber Industry Replanting Board has announced. Indications are that this year's replanting by small holders may set another record, the Board stated. Applications to replant 78,738 acres with grants have been made so far this year.

—•—

Tokyo—The Japanese rubber manufacturing industry is pressing for early realization of its plan to produce synthetic rubber. The Ministry of Trade is now said to be awaiting a "top level" decision which would signalize official support by the government. Special legislation may be required to implement the project which involves the establishment of a semi-official corporation which would be set up to start production by 1959. The production target is 45,000 tons a year.

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Paris—Michelin has set up a subsidiary company in South Vietnam to work rubber plantations and market raw rubber. The subsidiary is called "Societe Michelin de Production de Caoutchouc" and is located at Dinn-Thanh in the province of Binh-Dwong.

—•—

Colombo—Ceylonese rubber producers are getting about 15c (Ceylon) less per pound of sheet rubber bought by the government for shipment to Red China. The price reduction went into effect on March 14 and was attributed to the fall in the world market price for rubber during the past few months. The price paid to Ceylon for rubber by Red China is calculated on a sliding scale based on Singapore prices.

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Tokyo—A Japanese vinyl chloride manufacturing company belonging to the Furukawa financial group has submitted a plan to the Ministry of Trade calling for a plant for the production of synthetic rubber. The Nippon Geon Co. said it planned to conclude a technical agreement with the B. F. Goodrich Chemical Co. for this purpose. The ultimate objective is to produce 15,000 tons of various types of synthetic rubber per year. The project is backed by the Yokahama Rubber Co.

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Bonn—Current reports state that West German production of synthetic rubber will be more than tripled next year when the new 45,000 ton plant at Huels starts up. Later, however, some of West Germany's existing capacity, amounting to 13,000 tons, will be shipped as being more costly to run than the new plant.

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OVERSEAS (CONT'D)

Tokyo—Dunlop Rubber Co. (Japan), Ltd. has signed a contract with Egypt for the export of automobile tubes totaling $100,000 in value. This will amount to about 3,000 tubes. The contract is the second agreement with Egypt since December of 1956 when Japan exported about 6,000 smaller sized tubes of the same value.

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London—Freight rates on rubber from the Far East to Europe will rise by 15% effective June 1, according to a statement by a representative of the United Kingdom Far Eastern Freight Conference. The increase stems from a general increase in freight rates between the U.K. the continent and Japan, the Philippines and the Far East. The general increase is about 10% for most other cargoes.

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Djarkata—A leading rubber broker indicates that Red China has bought about 15,000 tons of rubber from Indonesia since the start of 1957. There are other reports which state that Red China is contemplating the purchase of an additional 5,000 tons in the very near future.

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Brussels—The Belgian Congo exported 32,000 tons of rubber in 1956 compared with 26,083 tons in 1955. The increase is attributed to the entry into production of a large acreage of formerly unproductive rubber plantations. The present yield of Congo rubber plantations is 800 kilos per hectare, but is as high as 1,200 kilos on some plantations.

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Kuala Lumpur—The Malayan Government has announced plans to refund $8,000,000 (Malayan) to rubber estate owners as the third refund installment of the anti-inflationary cess levied in 1955. The fourth and last installment, amounting to $7,000,000 (Malayan) plus interest, will be paid in June or July.

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London—The Board of Trade has denied reports from Singapore that the Board has launched a natural rubber buying program to replenish the stockpile in England. Traders in London state they have seen no evidence to indicate increased government buying.

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Tokyo—The Japan Tire Manufacturers' Association reports that exports of bicycle tires in 1956 reached a total worth $2,900,000. This is about three times the value of shipments in the previous year. Nearly 30% of the total was shipped to Singapore. This was followed by Vietnam and other Southeast Asian countries. Only 10% was exported to South and Central America and Africa.

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Hong Kong—Ceylon's first ambassador to Red China stated recently that he hopes the China-Ceylon rubber for rice agreement will continue even after the expiration of the five-year pact at the end of this year. He said "China came to our rescue in 1952 when we wanted rice very badly and they also helped to maintain our rubber industry, for which we are very grateful."

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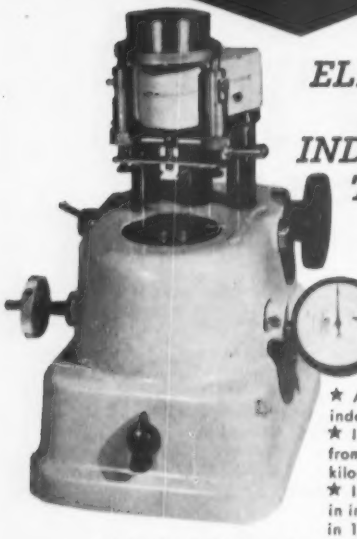

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New Goods

Ezy-Clean Stair Tread

Robbins Floor Products, Inc., Tuscumbia, Ala., has introduced a new rubber stair tread, which is said to be safe, tough and attractive. Called "Robbins Ezy-Clean Rubber Stair Treads," they are available in six color styles matching the Robbins Micro-Finish color tile. Round-nose or square-nose edging is molded to fit over

the step in one piece. A diamond design on the walking surface prevents skidding and slipping. The treads are available in widths of 9, 12, 15 and 18 inches and lengths of 3, 4, 5, and 6 feet. The tread is designed with 5/16 inch thickness at the heaviest wearing point tapering to 3/16 inch thickness at the rear to match the standard 3/16 inch rubber tile on stair landings.

Sensitex Surgeon's Glove

A new surgeon's glove said to be up to 1½ times as soft as any other rubber glove has been developed by B. F. Goodrich Industrial Products Co., Akron, Ohio. Named "Sensitex", the new glove is more sensitive to the touch and less tiring to the hands than other surgeon's gloves, the company states. Tested against other high quality gloves, Sensitex proved to be 33 per cent softer, 25 per cent stronger and to have 27 per cent more elongation and 116 per cent more tear resistance. After five standard sterilizations (15 minutes at 258°F.), the glove was 56 per cent softer, 64 per cent stronger and had 28 per cent more elongation and 170 per cent more tear resistance. After 10 sterilizations the glove was still superior to others tested, Goodrich says. Production will begin as rapidly as possible as a part of the company's expanding operation in the sundries field. Shown above is a comparison of the Sensitex glove to another glove in the elongation test. Company engineers say the softness and tear-resistance of the rubber are directly related to its ability to stretch easily.

An index to Volume 80 of RUBBER AGE will be found on pages 189 to 192 of this issue.

Air-Loc Mounting Pad

"Air-Loc", a compact, new machine mounting pad said to reduce machinery noise and vibration, has been introduced by Clark-Cutler-McDermott Co., Franklin, Mass. According to the firm, Air-Loc reduces noise and absorbs vibrations and shock loads, improving machine performance and lengthening machine life. Flooring and building structures are also protected. Compounded with

Geon resin, sisal and granulated cork, the pad is intended for use with such equipment as textile looms, metal punch presses, meat cutters, industrial electric mounts, printing presses, pumps, machine tools and similar applications. The Geon resin binds the material and provides resistance to water, oil, grease, most acids and alkalis. Both tough and flexible, the pad recovers 99 per cent of original thickness even after repeated loadings of 1000 pounds per square inch. An integrated cross grid embossing eliminates the need for cementing or bonding.

Pressure Sensitive Teflon Cloth

General Plastics Corp., 165 Third Ave., Paterson, N. J., has introduced pressure sensitive "Teflon" cloth. An adhesive back, protected by a strippable paper, offers a simple and economical method of using Teflon. The anti-stick qualities of the material may now be easily applied to guides, slides, chutes, rails and other equipment hampered by sticking and build-up. According to the company, equipment has recently been installed to treat Teflon cloth tape and Teflon wire in order to make it bondable with commercial adhesives. Users may apply any adhesive necessary for application to the treated Teflon.

Multi-Colored Kar-Rugs

Wooster Rubber Co., Wooster, Ohio, has introduced a new line of multi-colored automobile mats called "Rubbermaid Kar-Rugs". The new design, like the Wooster deluxe Stylemaster series introduced two years ago, fits all makes of automobiles. Confetti colors, which show a sprinkling of varied hues against solid backgrounds of blue, grey, black or tan, are solidly integrated in the mats and will never wear off, the company says. The mat has a diamond-style top surface, designed to trap dirt and moisture. Molded buttons on the back provide ventilation and keep the mat in place. The mats are produced for front and rear floor surfaces.

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Show-Off Seat Covers

Fry-Duluth Co., Berkley, Mich., has introduced a new type of automobile seat cover specifically designed for quick installation. The seat covers, named "Show-Off", can be installed in five minutes, the company states, and come in transparent or opaque blue and green patterns.

The transparent covering is designed to protect upholstery from grime and at the same time show a colorful interior. The new seat cover features elastic clips, thus insuring a continual tight fit. Seams are moved away from the corners of cushions and backrests to achieve longer wear.

Klingwell Household Gloves

Sundries Division of the B. F. Goodrich Industrial Products Co., Akron, Ohio, has introduced two new Klingwell household gloves. Added to the Klingwell "Lanolized" glove, the new lines, called "Plushlined" and "Neoprex", enable Goodrich to offer a full line of household gloves. The coral-colored Plushlined glove is made with pure latex over a soft, plush, white lining that insulates against hot or cold water and keeps perspiration to a minimum, the company says. The Neoprex brand is made with turquoise neoprene over a pure latex coral lining. The neoprene coating resists grease, oil and detergent, while the double construction assures longer wear. Both glove lines have extra long gauntlets that can be turned down to catch dripping water and the palms and fingers are roughened with ridges to assure a firm grip. They are individually sized in small, medium and large.

Polyethylene Tablecloth

Inexpensive draperies and tablecloths made of Bakelite polyethylene are now being produced by the Hartford Textile Corp., 444 Fourth Ave., New York 16, N. Y. Designed to simulate damask or brocade, the new film fabrics are light in weight, resistant to dust and water and easy to clean. By improved techniques of embossing and inlay printing, the company has been able to produce the fabrics in a single process at high speeds.

Nappy Glitter Weave Picnic Bag

A Fiberglas insulated picnic bag, manufactured by Nappe-Smith Manufacturing Co., Farmingdale, N. J., features a textured Koroseal covering with an intricate woven effect pattern flecked with silver sparkles. "Nappy Glitter Weave" is durable, washable and scuff resistant, the company says. Weighing only 1¼ pounds, the bag has a seamless, one-piece lining which prevents leakage. The double-thick Owen-Corning Fiberglas insulation keeps food or beverage hot up to six hours and cold up to eight hours and also helps the bag to retain its shape. Nappy Glitter Weave has reinforced stitched handles and a rust-proof zipper. The bags come in two sizes: the first is 16 inches long, 10 inches deep and 6 inches wide. The other is 16 inches long, 11 inches deep and 8 inches wide.

Baby Set Vinyl Layette

Virtually a complete layette of waterproof items for the baby and his crib, carriage and basinette, has been introduced by the Rand Rubber Co., 397 Sumner Ave., Brooklyn 16, N. Y. Called the "Baby Set" and packaged in an attractive, durable three-drawer cabinet, the unit includes a selection of baby pants in small to large sizes, flannelette sheeting in three different sizes, an air-filled quilted rubber pad, waterproof bibs, and a diaper bag with pockets for both wet and dry diapers. A soft new patented vinyl material called "Breeth-ees", made with Geon vinyl resin, is utilized throughout the set. The breathable new material actually permits the passage of moisture vapor without impairing the waterproof qualities of the finished product.

Combination Picnic Bag

A three-way combination picnic bag made of Krene vinyl film has been introduced by Fashioncraft Products, 185-30th St., Brooklyn 32, N. Y. The new matched set can be used as a single unit for carrying hot and cold foods in one easy-to-carry bag, or as three individual, insulated bags, each of which can serve as a hot or cold food carrier. The handy inner units can also be used separately as ice cube containers, as frozen food shopping bags, or as lunch boxes. The larger outer unit has strap handles and can be carried like a suitcase. The bags are attractively styled in wipe-clean checks and tweeds. The outer units are built with spring-steel frames to prevent crushing. The outer bag measures 17½ by 10 by 8½ inches. The inner bags measure 9 by 8 by 7 inches.

Plastic-Covered Greenhouses

Vinylfilm, produced by the Goodyear Tire & Rubber Co., Akron, Ohio, is reported to be finding increasing use in greenhouse construction. Lightweight, the Vinylfilm as a cover enables the grower to build frameworks with lighter materials than ordinarily employed in standard greenhouse construction. Designed specifically to meet year 'round weather conditions, the flexibility of the film allows quick cover application, cutting closure time appreciably. Maintenance is reportedly reduced to occasional patching. Two basic types of greenhouse units are now being produced. One method consists of enclosing the frame with a series of single layer Vinylfilm. The other is constructed of individual film-covered panels which are then attached to a framework.

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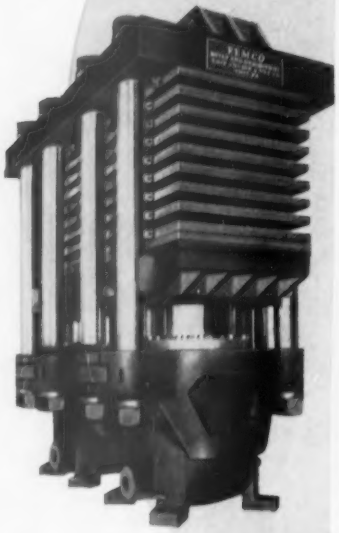

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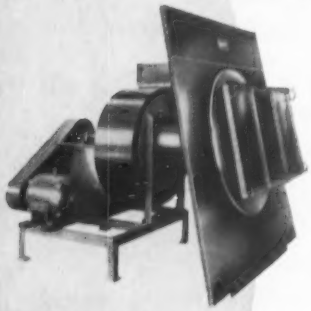

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New Equipment

Linar Photoelectronic Edge Guider

Linar Edgetrol is the name given to the photoelectrically actuated automatic device for precise control of edge register of moving material manufactured by the Intercontinental Dynamics Corp., Englewood, N. J. By means of four versatile sensing heads the unit can be used with a wide variety of materials, including such opaque materials as rubber, fabrics and plastics. Since the unit operates by means of electric light beams, no force or pressure of any kind is applied to the material

under control and consequently the finest substances can be handled with perfect accuracy. Comprised basically of two parts—a cast aluminum sensing head and an auxiliary control unit—the Edgetrol is said to be the simplest, most rugged and reliable apparatus ever designed for industrial use in the field of edge guidance. In operation, the sensing head is mounted in line with the edge of the material to be controlled. Two narrow beams of light scan the material while it is in motion. These are so located that only one beam is intercepted when correctly positioned. When the edge of the material moves inward, intercepting both beams, the positioning mechanism causes outward correction; reverse operation occurs when the material moves away, opening both beams.

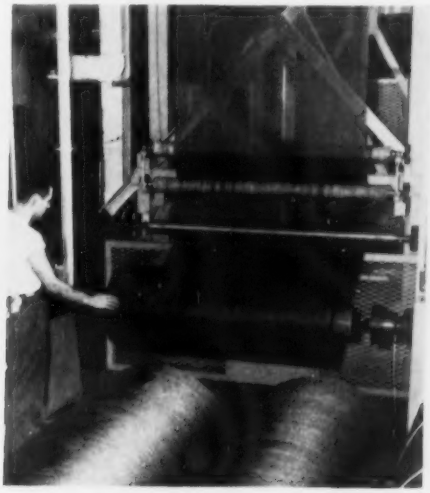
Hobbs 2-Shaft Turret Winder

The development of a new power-operated 2-shaft turret winder designed for use in back of an extruder laminator has been announced by the Hobbs Manufacturing Co., 26 Salisbury St., Worcester, Mass. This custom designed winder is a perfect example of automation in the winding of poly-coated cellophanes, krafts, plain paper, etc. The winder will accommodate rolls up to 1500 pounds. Previously, it was necessary to stop the winding process when a roll was completed, trim the material being wound, doff the roll, install a new roll and reset for winding. The new unit, equipped with an automatic cut-off and roll starting device, eliminates all down time and makes the process of winding continuous.

Litzler Automatic Expand/Aligner

The Expand/Aligner, a new unit which provides automatic edge, width and centering control anywhere in the web processing of tire cord fabrics and similar open-weave goods, has been introduced by C. A. Litzler Co., Inc., 1817 Brookpark Road, Cleveland 9, Ohio. The new unit spreads fabric to counteract shrinkage, respaces selvage cords to eliminate "crowding", corrects misalignment of either or both fabric edges to prevent damaged selvages and ragged windup, and removes wrinkles—all automatically.

The unit's spreading action is based on the efficient principle of the bowed axis roll, in which a curved-axis



rotating rubber roll offers a concave surface to the incoming fabric to spread warp cords. This basic principle has been refined by provision of a discontinuous expander roll axle having a flexible center section, so that either end may be bowed independently. Individual thrustor motors move the roll's axle ends, and respond to preposition gaging heads which sense the selvage positions of the departing fabric at either edge. Should either edge of the web tend to move from gage in either direction, the affected gage instantly actuates the appropriate thrustor motor to readjust roll curvature for the necessary correction. With both "halves" of the web thus completely controlled, not only are the precise desired width and selvage conditions maintained throughout the process, but the material is constantly and automatically kept on the true centerline of the equipment.

The compact Expand/Aligner units are particularly useful with storage accumulators, before dipping or saturating operations, after tension drying and before calendering and windup. For tire cord fabrics, the bowed expander roll has a flat center section, while for marquisettes, gauzes, crinolines, tulles, nettings and sheetings a radial roll is provided. A single-roll unit gives up to 6% spreading action across the fabric width; where more expansion is required, a double-roll model is available. For more extreme spreading, two double-roll units may be applied in tandem.

Handling cotton, rayon or nylon fabric in any denier, the Expand/Aligner works with equal efficiency anywhere in a tension range of from 50 to 300 pounds over a speed range of from 5 to 100 yards per minute.

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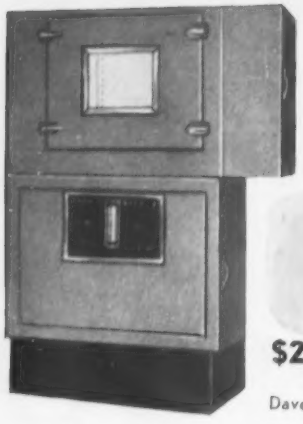

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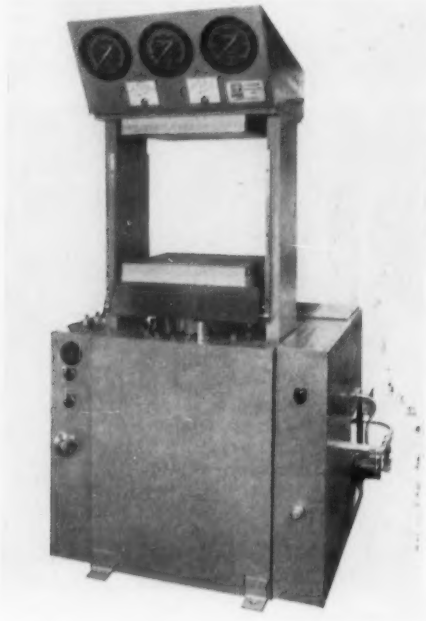
P-H-I 300-Ton Hydraulic Press

Designed to fill the need for a wide range of experimental pressing operations which required the application and maintenance of precise pressures through the entire range of the machine, a 300-ton double acting hydraulic press has been introduced by Pasadena Hydraulics, Inc., Pasadena, Calif. Three pressure gauges cover ranges from 0 to 20,000, 0 to 120,000 and 0 to 600,000 pounds. Any pressure selected from 1,000 to 600,000 pounds may be applied and indefinitely maintained to an accuracy of ±5%. A hi-lo hydraulic system is provided with a low pressure control to check the ram speed before the point of close. Two pyrometers permit convenient observation of the temperature of the steam platens in either Fahrenheit or Centrigrade degrees.

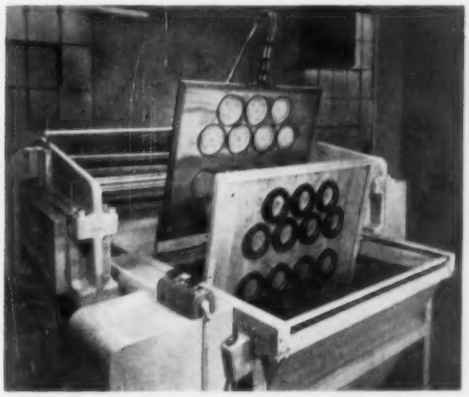


Dahl Sphincter Valve

A sphincter valve, designed for handling erosive process flows or flows containing gritty solids which cannot tolerate pockets but can accept neoprene or natural rubber, has been developed by the George W. Dahl Co., Inc., 430 High St., Bristol, R. I. It will produce minimum turbulence in the flow through the valve and is for use on slurry service where the solids in suspension tend to plug the conventional type control valve. The only parts exposed to wear in the sphincter valve are a rubber seat and an O-ring. The seat is compressed along its axis to produce throttling action and tight closure. Tests show that over many cycles closing off against 1000 psi water, the seat showed no evidence of wear. An adjustable travel stop is incorporated to prevent excess pressure on the seat. Sizes of ⅜ and ¼-inch O. D. tubing are available at present. Parts exposed to the process may be bronze, steel or stainless steel. Manual or air operators are available for quick interchange, when desired.

Roller Die Cutter Equipment

Automatic loading and unloading equipment which can be attached on three sizes of its heavy-duty roller die cutters has been announced by the Special Machinery Division of the Falls Engineering and Machine Co., Cuyahoga Falls, Ohio. The equipment was particularly designed for use on roller die cutters which are doing production trimming of molded rubber goods, small automotive rubber parts, including brake pedals, accelerator pedals, spring pads, toy tires and other small



items. The new time and labor saving equipment fits roller die models with bed sizes 48 x 42, 48 x 72, and 48 x 84 inches. On the larger sizes, the loading and unloading mechanism may be attached to each end of the machine, which means that at one end or the other the machine is always die cutting stock.

The equipment includes a steel frame, 36 x 30 inches, to which the dies are fastened. Powered by a motor-driven gear rack, the frame and dies move fully loaded onto the bed of the die cutter. The cut is made and the frame tilts, as seen in the accompanying illustration, dropping the die cut parts into a funnel-shaped hopper and to a tote pan, ready for pick-up and inspection. The automatic operation saves the handwork of removing the die cut parts and piling them up or placing them in a container. When the new attachment is used, the only manual steps left for the operator are to load the frame and to trim off the flash.

Autogil Automatic Shear

An automatic guillotine type shear, designed to cut coils or rolls of material quickly, cleanly and with unvarying precision is announced by Jaco Devices, Inc., Quincy, Mass. The new Jaco "Autogil" will cut exact lengths of coiled materials such as felt, fibers, foil, film, insulation, neoprene, leather, plastics, paper, rubber, tapes, textiles, webbing, wire and thin (up to .018-inch) metallic coiled materials. The Autogil is made in three models to accommodate materials 5, 12 and 15 inches wide and up to 3/16-inch thick depending on the hardness of the stock to be cut. Lengths from zero to 96" long are the maximum capacity of all models. After setting length of cut, the machine is completely automatic and will shear 120 pieces per minute until the roll of material is exhausted or, if equipped with an electric "predetermined counter", will shear until desired quantity has been cut off the roll.

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Reviews

BOOKS

Methoden der Organischen Chemie "Houben-Weyl" (Methods of Organic Chemistry). (Fourth Edition). Edited by Eugen Müller in cooperation with O. Bayer, H. Meerwein and K. Zeigler. Published by Georg Thieme, Stuttgart, Germany. 20 Volumes; average price $25.00 per volume; 7½ x 10½ in. (In German).

(EDITOR'S NOTE: An over-all review of "Houben-Weyl" appeared in the March, 1957, issue of RUBBER AGE. The review which follows considers the individual volumes published to date. As additional volumes appear in print they will be reviewed in these columns.)

Volume II—Analytische Methoden. By B. Eistert, H. Kienitz and H. Roth (Badische Anilin- und Sodafabrik), H. Henecka, E. Heuser, F. Hornig, P. Kurtz, M. Quaedvlieg, F. Tettweiler, E. van Hulle and F. Zinneke (Farbenfabriken Bayer), W. Bathe, J. Janecke and H. Persiel (Farbwerke Hoechst), T. Wieland (Universität Frankfurt a. M.), G. Bähr (Universität Greifswald), F. Arndt (University of Istanbul), F. Hein (Universität Jena), F. Turba (Universität Mainz), H. Meerwein (Universität Marburg), R. Criegee (Technischen Hochschule Karlsruhe), I. Hennig (Technischen Hochschule Stuttgart), A. Schöberl and A. Wagner (Tierärztlichen Hochschule Hannover) and H. Rheinboldt (São Paulo, Brazil), published in 1953. This volume devotes 21 pages of its first chapter "Organische Elementaranalyse" to qualitative organic analysis of the elements, and 218 pages to their quantitative determinations. Procedures for the direct determination of oxygen are included. Macro methods, semimicro methods and micro methods are presented. Ultramicro analysis is touched on briefly (four pages).

The next 439 pages, "Analytik der wichtigsten funktionellen Atomgruppen und Verbindungsklassen" contain a comprehensive presentation of proven methods for the determination of functional groups. The third chapter, "Gasvolumetrische und gasanalytische Methoden" (64 pages), discusses equipment, physical and chemical methods (general and special) used in the analysis of gases, and a table is given showing the most important physical data of gases. The next chapter "Bestimmung der Schmelz- und Gefriertemperature, der Siede- und Kondensationstemperatur" (40 pages) describes methods, apparatus and calculations used in melting and boiling point determinations. "Thermische Analyse, Bestimmung organischer Molekelverbindungen" (thermal analysis of molecular compounds) is the subject of the following 35 pages. The principles and the field of applications are discussed and methods of carrying out thermal analysis are presented.

"Chromatographische Analyse" (39 pages) is a brief but concise presentation of theory and practice of chromotographic methods of analysis. "Analyse von Lösungsmittelgemischen" (69 pages) is devoted to the analysis of solvents. Although this chapter contains little that is new or of general applicability, industrial chemists interested in identifying solvents consisting of non-complicated mixtures will find some useful hints presented. The difficulties inherent in analyzing multi-component mixtures of organic compounds are responsible for the limitations of this chapter. An author index (33 pages) and a subject index (51 pages) conclude this volume.

The shortcoming of this volume is the inadequacy of the index. The comprehensive tables of contents preceding each chapter are more helpful in locating the material than the index at the end of the book. The use of trivial German names, e.g. Nitroprussidnatrium, Blausäure, etc., is also apt to make the use of the index cumbersome to the chemist not educated in German schools. Notwithstanding his criticism, Volume II is one of the most valuable reference books made

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PROCEEDINGS of the Third Rubber Technology Conference

Copies of all the papers presented at the Conference held in London on June 22-25, 1954, under the auspices of the Institution of the Rubber Industry, are presented in this volume, together with the discussions on each paper. The papers are world-wide in character and represent the latest thinking in the science and general technology of rubber. This informative volume is a **must** for all who wish to keep abreast of developments in the field.

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Stability of Ammoniated Latex and Soap-Stabilized Emulsions in the Presence of Complex Zinc Salts. *T. S. McRoberts.*
Variability of Hevea Latex. *W. L. Resing.*
Zinc Oxide Testing of Latex. *E. W. Madge, H. M. Collier,* and *J. L. M. Newnham.*
Hevea Latex: Its Structure and Viscosity. *G. Verhaar.*
Contribution to the Study of Mineral Elements in Field Latex. *E. R. Beaufils.*
Rubber Peptized on the Plantation. *G. Giger, J. Lemee* and *M. Liponski.*

Production and Evaluation of Synthetic Rubber

Cation and Anion Influence in the Alfin Reagent for the Polymerization of Butadiene. *A. A. Morton, I. Nelidow* and *E. Schoenberg.*
Evaluation of Synthetic Rubbers and Latices. *I. D. Patterson.*
Recent Studies on the Structure of Synthetic Rubber. *R. F. Dunbrook, B. L. Johnson, J. L. Binder, J. M. Willis,* and *E. L. Carr.*
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Oil Resistance of Synthetic Rubbers Over Very Long Periods of Time. *B. Särnö.*
Structure and Solution Properties of High Molecular Weight Butadiene-Styrene Copolymers. *R. B. MacFarlane* and *L. A. McLeod.*
Pyridinium High Polymers—A New Class of Oil-Resistant Synthetic Rubbers. *W. B. Reynolds, J. E. Pritchard, M. H. Opheim,* and *G. Kraus.*

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Cross-Linking and Radiation Effects in Some Natural and Synthetic Rubbers. *A. Charlesby* and *D. Groves.*

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Rubber Reinforcement by Resins Formed in Latex. *J. van Alphen.*

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available to organic chemists. The general purpose as stated by the editors, to present a compilation of proven methods, has been accomplished in this volume by the authors, 14 of whom are from industry and 11 from the academic profession.

Volume III: Part 1—"Physikalische Methoden". By L. Jenckel and E. Dörnenburg (Atlas-Werke), H. Kienitz and W. Luck (Badische Anilin- und Sodafabrik), H. Hoyer, K. Rast and C. Wiegand (Farbenfabriken Bayer), K. L. Wolf and R. Wolff (Laboratorium für Physik und Chemie der Grenzflächen), H. Götte (Planck-Institut), F. Becker and A. Magnus (Universität Frankfurt a. M.), H. J. Cantow, G. Meyerhoff and G. V. Schulz (Universität Mainz), R. Huisgen (Universität München), R. Mosebach (Universität Tübingen), and G. Briegleb (Universität Würzburg). 954 pp. (1955). The first 89 pages of this book, "Thermodynamische Methoden", are an excellent refresher course in thermodynamics. The next 60 pages, "Ausführung kinetischer Versuche", deal with kinetic experiments and measurements.

The chapter "Bestimmung der Dichte" (51 pages) describes the determinations of density of liquids, solids and gases. Under the heading "Bestimmung der Löslichkeit" (32 pages) are presented methods of determining solubilities of solids in liquids, liquids in liquids and gases in liquids. The 66 pages of the chapter "Bestimmung des Dampfdruckes" are on the instruments and methods used in the determination of vapor pressure. The next chapter, "Bestimmung des Molekulargewichts", deals on 40 pages with determinations of molecular weight of low molecular weight materials, and on 74 pages with those of macromolecular materials. "Oberflächenspannung und Oberflächenaktivität" (26 pages) deals with surface tension and surface activity. "Calorimetrische Methoden" is the subject matter of 60 pages. "Bestimmung der Molekelform mit Hilfe von Raummodellen und Atomkalottenmodellen" (24 pages) describes the use of space models as an aid in the determination of molecular structures. This approach is more than just a means of depicting molecules; it uses space models as research tools. Polymer chemists will be disappointed in the briefness of this chapter.

"Fehlerbetrachtungen bei physikalischen Messungen" (18 pages) deals with the limits of error in physical measurements. "Mikroskopie und krystallchemische Untersuchungsmethoden" is a 79-page chapter, which is followed by a short chapter (8 pages), 'Charakterisierung und Untersuchungsmethoden flüssiger Krystalle", dealing with liquid crystals, and then by an excellent presentation of "Massenspektrometrische Methoden" (52 pages). "Isotopenmethoden" is the heading of a chapter which discusses in 81 pages the use of radioactive atoms in organic chemistry. "Analytische Bestimmung und Anwendung nichstrahlender Isotope" (53 pages) deals with analytical determination and use of non-radioactive isotopes. "Aurorenregister" (25 pages) and "Sachregister" (33 pages) comprise the author and subject indices. The subject index of this volume, as the index in Volume II, appears to this reviewer somewhat inadequate. The table of contents preceding each chapter will be found more useful.

Volume VIII—"Sauerstoff-Verbindungen III. By A. Dorlars, H. Henecka, P. Kurtz, A. Mitrowsky, S. Petersen and H. F. Piepenbrink (Farbenfabrik Bayer), R. Criegee (Technischen Hochschule Karlsruhe) and E. Ott (Stuttgart). (1952). The third volume, compiled to cover oxygen compounds, contains a chapter on peroxides (70 pages), a chapter on derivatives of carbonic acid (162 pages), a chapter on nitriles, isonitriles and fulminic acid (107 pages), a chapter on carboxylic acids and decarboxylation (138 pages), a chapter on esters of carboxylic acids (139 pages), and a chapter on functional nitrogen derivatives of the carboxyl group (63 pages), author index (35 pages) and subject index (26 pages). A valuable feature of the subject index is that preparative methods are indicated by page numbers printed in bold face type. The preparative methods presented appear carefully selected as to usefulness, and attainable yield (percent of theory) is given for all recommended methods.

F. R.

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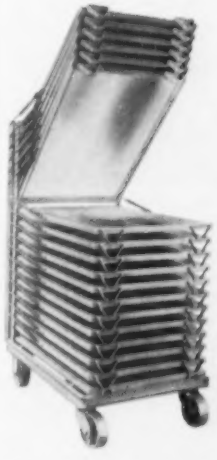

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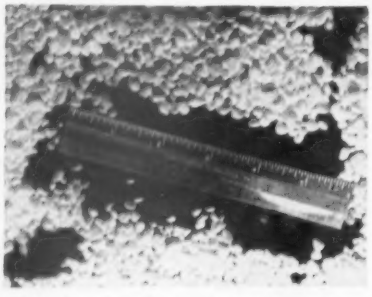

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BOOKLETS, CATALOGS, etc.

Georgia Kaolin Handbook. Georgia Kaolin Co., 433 North Broad St., Elizabeth, N. J. 8½ x 11 in. 80 pp.

Designed to provide a wide range of data on kaolin, this handbook contains four technical bulletins describing the company, its research activities and its products. Bulletin No. 1, containing 20 pages with illustrations, describes the company plant in Dry Branch, Georgia. Mining and processing of the material, research methods and product applications are covered. The second bulletin—16 pages in length—deals more specifically with the research activities of the firm, pinpointing in particular the various types of scientific instruments employed. An introduction to kaolin materials is given in Bulletin No. 3, also 16 pages, which treats with the Ajax kaolins, their development, testing and uses. In Bulletin No. 4, data are presented on Hydrite Kaolinites in reinforced plastics. Physical properties, recipes, mixing and molding techniques and advantages are included. Illustrations, tables and graphs add to the over-all effectiveness of the handbook. From time to time specially prepared specimen sheets, demonstrating paper surface coatings, calendering, etc., will be inserted in separate bulletins.

•

The Josephtown Story. Zinc Smelting Division, St. Joseph Lead Co., Josephtown, Penna. 8½ x 11 in. 34 pp.

During 1956, the Zinc Smelting Division of the St. Joseph Lead Co. observed its 25th anniversary of operation at Josephtown, Penna. In observance of the occasion the firm issued this lavishly illustrated booklet containing a brief account of the methods and procedures by which it makes its products, and describing the many other activities which are essential to successful operation. The original purpose of the Josephtown plant was to produce and distribute zinc oxide. That is still its chief purpose, but advancements in research and engineering have enabled it to expand into one of the largest and most modern zinc smelters in the world, making in addition to zinc oxide also zinc metal, cadmium and sulfuric acid. The photographs, in black and white and in color, show various views of the plant in operation, and diagrammatic charts depict the processes involved in production.

•

Plaskon Resins for Shell Molding. Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 8½ x 11 in. 32 pp.

The shell molding process for casting metals, with particular emphasis on the foundryman's problems, is the subject of this booklet. Discussed are design and production considerations, such as cost in comparison with other methods of producing castings; available types of molding machinery and factors in making a selection; gating techniques and precautions; pattern design; resin bonding of shell molds to insure tightness at the parting line; special metals handling, and sand reclamation, an important factor in cost analysis. Detail drawings and sketches with descriptive comments illustrate representative types of shell molding machinery, typical pattern designs, and recommended design techniques.

•

Sterling V in Nitrile Rubber Oil Seals. (Technical Service Laboratory Bulletin No. GD-15). Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. 8½ x 11 in. 5 pp.

This technical bulletin evaluates Sterling V in typical oil seal compounds of nitrile rubber used in sealing rings, O-rings, gaskets, bushings and grommets. By means of four tables, Sterling V is compared with Pelletex (SRF black), under conditions of equal loading, equal hardness, without plasticizer in a fuel resistant compound, and in an oil-resistant compound. Results of cure at 307°F. are presented, with tensile strength, modulus, elongation, compression set, volume change and hardness among factors considered. Blends of Sterling MT with Sterling V or Pelletex are shown in two of the tables.

Symposium on Minimum Property Values of Electrical Insulating Materials. (Special Technical Publication 188). Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. 6 x 9 in. 48 pp. $1.75.

In an effort to solve some of the perplexing problems still associated with electrical insulation, a symposium on minimum property values was held by ASTM Committee D-9 in February, 1956. All of the papers presented at that symposium are included in this booklet. The papers serve as an excellent starting point from which further research may go forward towards solving some of the existing problems. For example, several of the papers treat with such subjects as the significance of minimum property values of electrical insulating materials, extremal nature of dielectric breakdown, establishment of minimum quality levels of sheet insulation, variability of dielectric breakdown in sheet insulation, low temperature resistance test methods for non-rigid insulation, and statistical treatment of heat aging studies on varnished glass cloth. Additional papers of the type included in the booklet should enable designers to accurately predict the safety factors of various electrical insulation materials.

•

Dayton Poly-Koolfoam. Dayton Rubber Co., Dayton 1, Ohio. 9 x 12 in. 16 pp.

This is believed to be the first practical approach to a permanent catalog in the fast growing field of foamed-in-place flexible, semi-rigid and rigid urethane plastic polymers. It is a combination catalog and file folder that is easily kept up to date. The booklet features an inside back cover flap for the insertion of data sheets. The file section is being distributed with eight copyrighted pages of information on two-liquid component formulations. As additional data sheets are released, the file section is kept current merely by adding or deleting specified pages. In the four-page introductory section, the booklet explains how custom formulations are created for manufacturers to provide desired foamed-in-place synthetics without the need for costly capital investment. It also covers in-plant applications, electrical properties, bonding and adhesion, impact absorption, strength properties which exceed those of any synthetic or rubber, and thermal conductivity.

•

Important Facts About Bridgwater Machine Co. Bridgwater Machine Co., Akron, Ohio. 8½ x 11 in. 20 pp.

Issued in commemoration of its fiftieth anniversary, this colorful booklet depicts the activities of the company in various fields, including tire molds for the rubber industry and roller bearing journal housings and associated parts for the railroad industry. Production facilities offered by the company are emphasized in chart and text form and some of the special machines and machine tools designed and built by it are described in detail. A considerable portion of the booklet is devoted to the sub-contract service featured by the company to relieve difficult machining problems. This service is said to be of special value where extra production is needed.

•

Kralastic Extrusion. (Bulletin No. 1). By E. J. Trunk. Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. 8½ x 11 in. 16 pp.

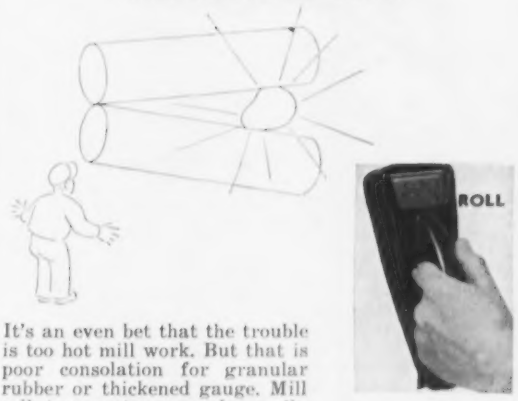
The extrusion of Kralastic, a blend of plastic and rubber, is explained in this new publication. The illustrated booklet describes equipment needed, the production process and average production rates for various dimensions of pipe. Also included is a list of Kralastic's properties and several graphs detailing its performance as a pipe material.

•

Harshaw Industrial Chemicals. Harshaw Chemical Co., 1945 East 97th St., Cleveland 6, Ohio. 8½ x 11 in. 22 pp.

In addition to a listing of the industrial chemicals produced by the company, this bulletin offers information on the history, branches, and operations of Harshaw. Many photographs show the offices, plants, laboratories and equipment involved in the manufacture of over 1000 chemicals for all industries.

When Lumps show up in the Calender Rolls



It's an even bet that the trouble is too hot mill work. But that is poor consolation for granular rubber or thickened gauge. Mill roll temperature can be easily checked, therefore intelligently controlled by the use of the Cambridge Surface Pyrometer. It is an accurate, rugged instrument that can be used while the rolls are in operation. Its use will help cut costs and make better rubber products. *Send for Bulletin No. 194-SA.*

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MARKET REPORTS

TRENDS
NEWS
PRICES

Natural Rubber

Since our last report (February 28), the price of spot rubber on the New York Commodity Exchange has moved in a range of 200 points, high for the period being 32.75c reached on March 20, and low being 30.75c reached on March 7. The average price of spot rubber for the month of March was 31.76c based on 21 trading days. This compares with an average of 30.43c in February.

Apparently some of the gray clouds which have overhung the rubber market from the start of the year are disappearing. The Suez situation may at last be clearing up. Within a short time, vessels of all tonnages will be moving through the canal. For all intents and purposes, gasoline and oil consumption in Europe, as it affects rubber products' production and consumption, is a thing of the past.

Somewhat threatening at the current time, however, is the prospect of a severe or prolonged strike in the United Kingdom which could involve several million persons. If such develops, it would hurt near-term U.K. rubber consumption. Aside from this factor, most world events seemingly are favorable to a firm price level for natural rubber.

Current Situation Improved

The current situation and sentiment with regard to prices is already considerably improved. The Indonesian political situation has been a large factor behind price firmness, but by no means the only one. The presumption that Malayan stocks have been reduced to "low side" proportions may reflect a greater inclination to withhold within Indonesia, at least until the political situation clears up there.

In Europe, with Suez almost out of the way as a price depressant, the realization is that the close balance now forecast between world natural rubber supply and demand this year will be a lot more constructive to prices. In that connection, a leading producer recently estimated that production and consumption of natural rubber this year will be about 1.9 million tons.

Automobile production has been picking up in Europe, as it has in the United States. For the year so far, output in the United States has been running at about 2% over last year. The trend of replacement tire sales has been encouraging. Trade sources believe that if the replacement tire market continues at the present volume, there is reason to expect the present price levels for natural to hold.

Natural rubber stocks in the U.S. are probably down to more normal levels. It is believed that any over-all improvement in world consumption will tend to cushion any price recessions.

Rubber Imports Down

The Department of Commerce reports that 39,889 long tons of natural rubber were imported into the United States in January, 1957, while 45,651 long tons were consumed. Stocks on hand at the end of the month totaled 11,512 long tons, a decrease of about 700 long tons from the stocks on hand at the end of the year.

NEW YORK, APRIL 1, 1957

Price Data

Closing Rubber Prices on New York Commodity Exchange

FROM MARCH 1 TO MARCH 31

Mar.	Spot	Mar.	May	July	Sept.	Sales
1	31.00	30.90	31.00	30.80	30.65	78
2	....	....	....	....	....	....
3	....	....	....	....	....	....
4	31.63	31.55	31.70	31.40	31.20	133
5	31.13	30.85	31.01	30.72	30.60	72
6	31.25	30.90	31.10	30.90	30.70	23
7	30.75	30.50	30.65	30.45	30.25	83
8	31.25	30.90	31.12	30.90	30.70	83
9	....	....	....	....	....	....
10	....	....	....	....	....	....
11	31.25	30.95	31.15	30.90	30.70	68
12	31.50	31.20	31.35	31.20	31.00	52
13	32.00	31.75	31.90	31.75	31.49	153
14	31.75	31.60	31.70	31.45	31.22	140
15	31.88	31.60	31.80	31.55	31.26	67
16	....	....	....	....	....	....
17	....	....	....	....	....	....
18	32.25	32.20	32.35	32.15	31.80	87
19	32.13	31.90	32.05	31.90	31.60	98
20	32.75	32.50	32.65	32.45	32.20	169
21	32.63	32.45	32.60	32.35	32.15	99
22	33.00	32.70	32.85	32.55	32.35	97
23	....	....	....	....	....	....
24	....	....	....	....	....	....
25	32.63	32.55	32.40	32.25	31.90	77
26	31.75	31.60	31.48	31.30	31.05	226
27	31.75	31.90	31.60	31.35	31.10	127
28	31.13	31.05	30.90	30.60	30.35	95
29	31.63	31.62	31.40	31.15	30.90	66
30	....	....	....	....	....	....
31	....	....	....	....	....	....

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.31¾
May	.31¾
June	.31⅜
Thin Latex Crepe:	
Spot	.35¾
Thin Brown Crepe, No. 2	.28¾
Flat Bark Crepe	.21¾

London Market
(Standard Smoked Sheets)

May	30.91 - 31.20
July-Sept.	30.76 - 31.06

Singapore Market
(Standard Smoked Sheets)

May	29.13 - 29.24

Middling Upland Quotations

	Feb. 28	April 1		
	Close	High	Low	Close
May	35.25	35.26	35.16	35.19
July	34.68	34.70	34.64	34.68
Oct.	33.08	33.61	33.48	33.57

Notes & Quotes

World consumption of rubber is likely to exceed 4,000,000 tons a year within the next ten years, according to George Beharrel, managing director of the Dunlop Rubber Co., Ltd., London, England. This compares with 1,450,000 long tons in 1936, almost all natural rubber, and over 3,000,000 tons in 1956, including 40% synthetic rubber. Mr. Beharral said that the use of natural rubber last year was just about in balance with production. While he did not predict how much synthetic rubber would be used in the next ten years, he stated that scientific methods would probably bring about a reduction in the cost of producing natural rubber.

Synthetic Rubber

While conclusions should not be drawn from the statistics available in the first two months of a given year, it is, nevertheless, interesting to note that production of GR-S type rubber in the first two months of this year is trailing production in the first two months of 1956 by about 9,000 tons. In January of this year, 75,629 long tons of GR-S type rubber were produced in the United States, according to the Rubber Manufacturers Association. In February, 65,688 long tons were produced for a two month total of 141,317 long tons.

In the first two months of the preceding year, a total of 149,485 long tons of GR-S type rubber were produced. If we take 70,000 long tons as the average monthly production of GR-S type rubber for the balance of 1957, it will be seen that the totals for the year will approximate 840,000 long tons. This will be almost 40,000 long tons less than that produced in the previous year.

Synthetic Stocks Decline

At the end of 1956, the Department of Commerce estimated that there were some 151,000 long tons of GR-S type in stocks on hand. RMA now reports that at the end of February there were 135,222 long tons on hand.

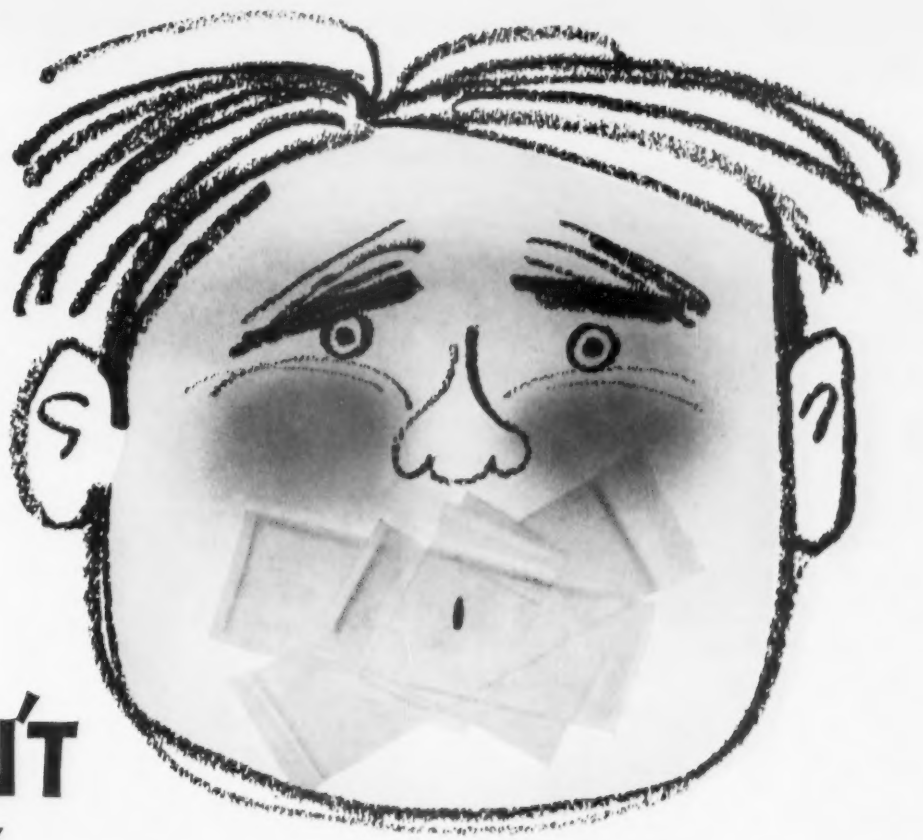
With this quantity of synthetic on hand, the synthetic producer is obviously in a position to regulate output so that a market glut can be avoided. It will be remembered that at year end there were some 200,000 long tons of all types of synthetic rubber in stocks on hand. It was felt in many quarters that this was "on the high side." Lower average production of synthetic rubber in the first two months of this year, therefore, may only be an attempt to balance more carefully the supply-demand situation.

Consumption is possibly the better guide to the future. In the first two months of this year, RMA reports, 136,535 long tons of GR-S type were consumed in the United States. This compares with the 127,743 long tons consumed in January and February of 1956. If we carry out the average consumption of the first two months of 1957 to the end of the year, we find that about 816,000 long tons of GR-S type rubber will be consumed.

This figure is about 100,000 tons more than the quantity of GR-S type rubber consumed in 1956. Consumption of GR-S type rubbers was higher at the beginning of 1956 than it was at the end of the year. In 1955, the reverse held true. Thus, it will be seen that there are no hard and fast rules which govern consumption. Many factors, be they political, economic and even psychological, exert their influences.

Other Types Stable

Neoprene, butyl and nitrile rubbers, on the other hand, are showing, at this point, a consumption pattern very similar to that of 1956. In each case, consumption in the first two months of 1957 is at or close to that shown in the first two months of the previous year.



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PRICES OF COMMERCIALLY AVAILABLE SYNTHETIC RUBBER POLYMERS

(dry types—per pound carload unless otherwise specified)

Butadiene-Acrylonitrile Types

Butaprene NAA	.5400 [1]
Butaprene NF	.4900 [1]
Butaprene NL	.5000 [1]
Butaprene NXM	.5800 [1]
Chemigum N1	.6400 [2]
Chemigum N3	.5800 [2]
Chemigum N5	.5800 [2]
Chemigum N6	.5000 [2]
Chemigum N7	.5000 [2]
Hycar 1061	.5800 [2]
Hycar 1062	.5000 [2]
Hycar 1014	.6000 [2]
Hycar 1041	.5800 [2]
Hycar 1042	.5000 [2]
Hycar 1043	.5000 [2]
Hycar 1312	.5000 [2]
Hycar 1411	.6200 [2]
Hycar 1432	.5900 [2]
Hycar 1441	.6200 [2]
Paracril AJ	.4850 [2]
Paracril B	.5000 [2]
Paracril BJ	.5000 [2]
Paracril BLT	.5000 [2]
Paracril C	.5800 [2]
Paracril CV	.5900 [2]
Paracril D	.6500 [2]
Paracril 18-80	.6000 [2]
Polysar Krynac 800	.5000 [3]
Polysar Krynac 801	.5800 [3]
Polysar Krynac 802	.5000 [3]
Polysar Krynac 803	.5000 [3]

Butadiene-Styrene Types

Ameripol 1000	.2410 [3]
Ameripol 1001	.2410 [1]
Ameripol 1002	.2435 [1]
Ameripol 1006	.2410 [3]
Ameripol 1007	.2425 [3]
Ameripol 1009	.2475 [3]
Ameripol 1500	.2410 [3]
Ameripol 1501	.2410 [3]
Ameripol 1502	.2410 [3]
Ameripol 1703	.2060 [3]
Ameripol 1705	.2035 [3]
Ameripol 1707	.1910 [3]
Ameripol 1708	.1910 [3]
Ameripol 1710	.1885 [3]
Ameripol 1712	.1885 [3]
ASRC 1000	.2410 [3]
ASRC 1001	.2410 [3]
ASRC 1004	.2410 [3]
ASRC 1006	.2410 [3]
ASRC 1018	.2700 [3]
ASRC 1019	.2650 [3]
ASRC 1500	.2410 [3]
ASRC 1502	.2410 [3]
ASRC 1503	.2625 [3]
ASRC 1703	.2060 [3]
ASRC 1708	.1910 [3]
Baytown 1600	.1760 [2]
Baytown 1601	.1760 [2]
Baytown 1602	.1760 [2]
Baytown 1801	.1600 [2]
Copo 1500	.2410 [3]
Copo 1502	.2410 [3]
Copo 1505	.2610 [3]
Copo 1712	.1885 [3]
FR-S 1000	.2410 [3]
FR-S 1001	.2410 [3]

Butadiene-Styrene (Cont'd)

FR-S 1004	.2410 [3]
FR-S 1006	.2410 [3]
FR-S 1009	.2475 [3]
FR-S 1010	.2600 [3]
FR-S 1012	.2425 [3]
FR-S 1013	.2500 [3]
FR-S 1014	.2810 [3]
FR-S 1015	.2910 [3]
FR-S 1500	.2410 [3]
FR-S 1502	.2410 [3]
FR-S 1703	.2060 [3]
FR-S 1705	.2035 [3]
FR-S 1712	.1885 [3]
Naugapol 1016	.2650 [3]
Naugapol 1018	.2700 [3]
Naugapol 1019	.2650 [3]
Naugapol 1021	.3000 [3]
Naugapol 1022	.2800 [3]
Naugapol 1023	.2850 [3]
Naugapol 1503	.2625 [3]
Naugapol 1504	.2950 [3]
Philprene 1000	.2410 [1]
Philprene 1001	.2410 [1]
Philprene 1006	.2410 [1]
Philprene 1009	.2475 [1]
Philprene 1010	.2600 [1]
Philprene 1018	.2700 [1]
Philprene 1019	.2650 [1]
Philprene 1100	.1920 [1]
Philprene 1104	.1880 [1]
Philprene 1500	.2410 [1]
Philprene 1502	.2410 [1]
Philprene 1503	.2625 [1]
Philprene 1600	.1910 [1]
Philprene 1601	.1910 [1]
Philprene 1605	.1880 [1]
Philprene 1703	.2060 [1]
Philprene 1706	.2030 [1]
Philprene 1708	.1910 [1]
Philprene 1712	.1880 [1]
Philprene 1803	.1730 [1]
Pioflex 1006	.2410 [3]
Pioflex 1500	.2410 [3]
Pioflex 1502	.2410 [3]
Pioflex 1703	.2060 [3]
Pioflex 1710	.1885 [3]
Pioflex 1712	.1885 [3]
Pioflex 1773	.2060 [3]
Pioflex 1778	.1910 [3]
Polysar Kryflex 200	.2410 [3]
Polysar Krylene	.2410 [3]
Polysar Krylene NS	.2410 [3]
Polysar Krynol 651	.1885 [3]
Polysar Krynol 652	.1910 [3]
Polysar S	.2410 [3]
Polysar S-50	.2410 [3]
Polysar S-X-371	.2550 [3]
Polysar SS-250	.3000 [3]
S-1000	.2300 [2]
S-1001	.2300 [2]
S-1002	.2325 [2]
S-1006	.2300 [2]
S-1011	.2325 [2]
S-1013	.2300 [2]
S-1100	.1850 [2]
S-1500	.2300 [2]
S-1502	.2300 [2]
S-1600	.1825 [2]
S-1601	.1825 [2]
S-1602	.1825 [2]

Butadiene-Styrene (Cont'd)

S-1703	.1950 [2]
S-1706	.1925 [2]
S-1707	.1800 [2]
S-1709	.1775 [2]
S-1712	.1775 [2]
S-1801	.1675 [2]
Synpol 1000	.2410 [1]
Synpol 1001	.2410 [1]
Synpol 1002	.2435 [1]
Synpol 1006	.2410 [1]
Synpol 1007	.2410 [1]
Synpol 1009	.2475 [1]
Synpol 1012	.2425 [1]
Synpol 1013	.2500 [1]
Synpol 1061	.2410 [1]
Synpol 1500	.2410 [1]
Synpol 1502	.2410 [1]
Synpol 1551	.2410 [1]
Synpol 1703	.2060 [1]
Synpol 1707	.1910 [1]
Synpol 1708	.1910 [1]
Synpol 1711	.1900 [1]

Butyl Rubbers

Enjay Butyl 035	.2300 [2]
Enjay Butyl 150	.2300 [2]
Enjay Butyl 165 NS	.2400 [2]
Enjay Butyl 215	.2300 [2]
Enjay Butyl 217	.2300 [2]
Enjay Butyl 218	.2300 [2]
Enjay Butyl 268 NS	.2400 [2]
Enjay Butyl 325	.2300 [2]
Enjay Butyl 365 NS	.2400 [2]
Polysar Butyl 100	.2450 [3]
Polysar Butyl 101	.2775 [3]
Polysar Butyl 200	.2450 [3]
Polysar Butyl 300	.2450 [3]
Polysar Butyl 301	.2550 [3]
Polysar Butyl 400	.2450 [3]

Neoprene

	(prices f.o.b.)
Neoprene Types AC and CG	.5500 [2]
Neoprene Type GN	.4100 [2]
Neoprene Type GN-A	.4100 [2]
Neoprene Type GRT	.4200 [2]
Neoprene Type KNR	.7500 [2]
Neoprene Type S	.4200 [2]
Neoprene Type W	.3900 [2]
Neoprene Type WHV	.3900 [2]
Neoprene Type WRT	.4500 [2]
Neoprene Type WX	.4100 [2]

Silicone Rubbers*

	(prices f.o.b.)
GE (compounded)	2.50 [3]
GE Silicone Gum (not compounded)	4.00 [3]
Silastic (compounded)	1.90 [3]
Silastic (gums)	3.85 [3]
Union Carbide (gums)	4.00 [3]
Union Carbide (compounds)	2.50 [3]

Polysulfide Rubbers

	(prices f.o.b.)
Thiokol Type A	.4700 [2]
Thiokol Type FA	.6400 [2]
Thiokol PR-1	.9500 [2]
Thiokol Type ST	1.00 [2]

(latices—all prices per pound dry weight)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600 [1]
Butaprene N-400	.5400 [1]
Butaprene N-401	.5400 [1]
Chemigum 200	.4900 [2]
Chemigum 235	.5400 [2]
Chemigum 236	.5400 [2]
Chemigum 245	.4600 [2]
Chemigum 246	.4600 [2]
Hycar 1512	.4600 [2]
Hycar 1551	.5400 [2]
Hycar 1552	.4600 [2]
Hycar 1561	.5400 [2]
Hycar 1562	.4600 [2]
Hycar 1571	.5400 [2]
Hycar 1572	.5100 [2]
Hycar 1577	.4600 [2]
Hycar 1852	.4400 [2]

Butadiene-Styrene Types

Copo 2101	.3000 [3]
Copo 2102	.3200 [3]

Butadiene-Styrene (Cont'd)

Copo 2105	.3200 [3]
Copo X-765	.3000 [3]
FR-S 2000	.2600 [2]
FR-S 2001	.2600 [2]
FR-S 2002	.2850 [2]
FR-S 2003	.2950 [2]
FR-S 2004	.2950 [2]
FR-S 2006	.2600 [2]
FR-S 2105	.3100 [2]
Pliolite 2101	.3000 [3]
Pliolite 2104	.3200 [3]
Pliolite 2105	.3200 [3]
Pliolite X-765	.3000 [3]
Naugatex 2000	.2630 [2]
Naugatex 2001	.2630 [2]
Naugatex 2002	.2880 [2]
Naugatex 2006	.2630 [2]
Naugatex 2105	.3120 [2]
Naugatex X-765	.2900 [2]
Naugatex X-767	.3120 [2]

Butadiene-Styrene (Cont'd)

S-2000	.2275 [2]
S-2006	.2150 [2]
S-2101	.2250 [2]
S-2105	.3100 [2]

Neoprene

Neoprene Latex 60	.4000 [2]
Neoprene Latex 571	.3700 [2]
Neoprene Latex 572	.3900 [2]
Neoprene Latex 601-A	.4000 [2]
Neoprene Latex 735	.3800 [2]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3700 [2]
Neoprene Latex 950	.4700 [2]

Polysulfide Rubbers

Thiokol Type MX	.7000 [2]
Thiokol Type WD-2	.9200 [2]
Thiokol Type WD-6	.7000 [2]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

MARKETS

(continued)

Reclaimed Rubber

In the last two months of 1956, the production of reclaimed rubber was running at about 20,000 tons a month in the United States. January of this year has seen an upward turn, with 25,001 long tons of reclaim produced. Consumption of 24,081 long tons in January, is up about 4,000 tons from each of the preceding two months.

If this production-consumption pace were to be maintained for the remainder of the year, some 300,000 long tons of reclaim will have been produced by year end and only slightly less will have been consumed. In both cases, the figures would be considerably in excess of those for 1956 and they would, in fact, come closer to the highs of 1955.

The realities of the situation, in the opinion of many in the trade, lie somewhere between the figures for 1955 and 1956, with production at about 280,000 to 290,000 long tons and consumption at or near these figures.

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11¼
First Line Whole Tire	.11
Second Line Whole Tire	.10½
Third Line Whole Tire	.10¼
Fourth Line Whole Tire	.09¾
Black Carcass	.15¼
No. 1 Light Colored Carcass	.22
No. 1 Peel	.11
Butyl Tube Reclaim	.14
Natural Rubber Black Tube	.16
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

Few changes have been noted in the scrap rubber market during the past period in that activities were largely confined to the filling of mixed automobile tire orders for March shipment. Some movement of tubes was noted but prices in this segment of the market generally tended to be on the weak side.

A "where do we go from here" attitude seems to characterize the feelings of many in the trade. The usual heightening of activity in the spring has not materialized to any great extent, at least where the scrap market is concerned. The price structure remains stable at levels which, while permitting the continuance of operations, do not bring with them any great hopes for the months which lie ahead. Current prices as reported by the trade, follow:

(Prices Delivered Akron)

Mixed tires	ton	16.00
Light colored carcass	lb.	.05½
No. 1 peelings	ton	45.00
No. 2 peelings	ton	30.00
No. 3 peelings	ton	20.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	19.00
Passenger S.A.G.	ton	17.50
Natural Rubber Red Tubes	lb.	.07¼
Natural Rubber Black Tubes	lb.	.07
Butyl Rubber Tubes	lb.	.04¼

Tire Fabrics

Many users of industrial fabrics, according to a recent survey, are enjoying fairly good business. Yet, they are continuing to hold back on any sizable purchases of unfinished fabrics. The reluctance among many secondary producers to purchase any sizable quantity of fabrics is attributed to several factors, including the tight money situation and an extremely inventory conscious attitude.

Manufacturers in all sections of the country are trying to get along on the slimmest quantity of goods possible, trade sources report, and are buying only where they absolutely need goods to meet their own commitments.

Large Quantities Available

Current market conditions in the industrial cloth market make it easy for manufacturers to follow such a policy, more so since mills have large quantities of goods on hand. Secondary producers consequently don't have to carry any appreciable inventories themselves.

In addition to the immediate availability of cloth, the soft tone of the current market also is encouraging many buyers to hold off on anything except essential purchases. Prices are continuing to display weakness as they have now for a number of months. Buyers currently believe that as long as large quantities of goods are being offered, prices will continue to be subject to shading. The tight money supply is aggravating this situation since most producers do not wish to tie up ready cash in stocks.

Carryover Stocks Large

One other factor which is holding up buying among users of industrial fabrics this year is the poor season experienced in a number of lines last year, resulting in carryovers of excess quantities of goods. The coaters supplying the automobile trade, for example, had a considerable volume of excess goods on hand, including headlinings and wide fabrics. Stripers and awning producers also had a bad season a year ago due to adverse weather in the spring and consequently ended the season with large stocks.

There is a danger to this situation, trade spokesmen point out, since the lack of goods among coaters and manufacturers could result in the loss of some business, especially where a customer requires a rush shipment. In addition, any sudden pickup would be likely to tighten supplies since most mills now have sharply curtailed gray cloth production.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.73
1650	lb.	.67
2200	lb.	.67½

Nylon Tire Cord

210	lb.	1.95
840	lb.	1.80

Rayon Graded Fabric

100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

14.4 oz. (per square yard)	lb.	.71
9.25 oz. (per square yard)	lb.	.67
11.65 oz. (per square yard)	lb.	.63
8.9 oz. (per square yard)	lb.	.69

Liquid Latex

Natural: The Rubber Manufacturers Association estimates that 4,958 long tons of natural rubber latex were imported into the United States in January and 5,101 long tons in February, for a total two-month supply of 10,059 long tons. A total of 450 long tons were re-exported during the period leaving a total net new supply of 9,609 long tons.

The Association also estimates that in January of this year a total of 7,038 long tons of natural rubber latex were consumed in the United States while 6,193 long tons were consumed in the following month, for a total two-month consumption of 13,231 long tons. Natural rubber latex is currently selling at 38.25c per pound in car load lots at East Coast ports.

In comparing the first two months of 1957 with the first two months of the previous year, it will be seen that about 8,000 long tons less were imported in the first two months of this year. Consumption in both periods, however, was similar at about 13,000 tons each.

Synthetic: Production of synthetic latices in the United States is currently running at about 9,000 long tons a month. GR-S type latices account for approximately 7,000 tons of this total, with the remainder divided between neoprene and nitrile types. If this production rate were to be maintained throughout 1957, year-end totals which show a production of 108,000 long tons, with 84,000 long tons being GR-S type, and 12,000 long tons each for neoprene and nitrile.

These figures would be a little higher so far as the neoprene and nitrile latices are concerned when compared with 1956 and even 1955. They would be a good deal higher in the case of the GR-S latices, about 15,000 long tons more than in each of the two preceding years.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in a range of 80 points since our last report (February 28), high for the period being 35.80c reached on March 27, and low being 35.00c reached on March 11. The average price of spot cotton for the month of March was 35.35c based on 21 trading days. This compared with an average of 34.82c in the previous month.

The General Services Administration has been authorized to draw up a plan for the disposition of the supply of extra long staple cotton now being held in the national stockpile. Franklin G. Floete, Administrator of General Services, announced that the Departments of Agriculture and State and the Business and Defense Services Administration of the Department of Commerce will be consulted in the development of a plan which, when completed, must be submitted to Congress for approval.

The removal of extra long staple cotton from the current list of strategic and critical materials and the development of a program for the sale of the stockpile inventory of the program were authorized by Arthur S. Flemming, former Director of the Office of Defense Mobilization, in the light of a determination that a sufficient quantity of domestic extra long staple cotton can be grown to meet current anticipated military and essential civilian requirements.

MARKET PRICES

CHEMICALS & COMPOUNDING INGREDIENTS

APRIL 1, 1957

Prices are, in general, f.o.b. works and cover the domestic markets only. Export prices, as a rule, are usually slightly higher, due to packing regulations, special handling, etc.

Abbreviations: bbls., barrels; c.l., carload; cyl., cylinder; dlvd., delivered; dms., drums; eqld., equalized; l.c.l., less than carload; M.B. masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

*Trademark. †For Export Only.

The arrangement of this section closely follows the Chemical Section of the 1955-56 RUBBER RED BOOK. Readers are referred to that edition for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

ACCELERATORS

A-1 (Thiocarbanilide)*	lb.	.72	.79
A-32*	lb.	.66	.80
A-100*	lb.	.52	.66
Accelerator No. 8*	lb.	—	1.10
Accelerator—49*	lb.	.57	.58
Accelerator 89*	lb.	—	1.20
Accelerator 108*	lb.	—	.90
Accelerator—552*	lb.	—	2.25
Accelerator—808*	lb.	.66	.68
Accelerator—833*	lb.	1.17	1.19
Accelerator B*	lb.	—	.89
Altax*	lb.	.52	.54
Ancap*(†)	lb.	.38	.40
Ancatax*(†)	lb.	.48	.50
Ancazate BU (ET & ME)*(†)	lb.	—	1.07
Ancazide ET*(†)	lb.	—	1.07
ME*(†)	lb.	—	1.14
Arazate*	lb.	—	2.25
Arquad 12*	lb.	.55	.61
Beutene*	lb.	.66	.68
Bismate, Rodform*	lb.	—	3.00
Butazate*	lb.	—	1.04
Butyl Eight*	lb.	1.10	1.35
Butyl Namate	lb.	.45	.50
Butyl, Ethyl & Methyl Zimate Slurry (50% solids content)	lb.	.85	.89
Captax*	lb.	.42	.44
C-P-B*	lb.	—	1.95
Cumate, Rodform*	lb.	—	1.45
Diorthotolylguanidine	lb.	.62	.63
Dipac*	lb.	—	.85
Diphenylguanidine	lb.	.52	.58
El Sixty*	lb.	.60	.67
Ethazate*	lb.	—	1.04
50D*	lb.	—	.85
Ethyl Thiurad*	lb.	—	1.04
Ethyl Tuex*	lb.	—	1.04
Ethylac*	lb.	.93	.95
Guantal*	lb.	.60	.67
Harvex*	lb.	.70	.76
Hepteen Base*	lb.	—	1.85
Kure-Blend MT*	lb.	—	.70
Ledate, Rodform*	lb.	—	1.04
MBT-XXX*	lb.	.53	.55
Merac*	lb.	.75	1.05
Mercaptobenzothiazole	lb.	.42	.44
Mercaptobenzothiazyl Disulfide	lb.	.52	.54
Mertax*	lb.	.53	.60
Methazate*	lb.	—	1.04
Monex*	lb.	—	1.14
Mono Thiurad*	lb.	—	1.14
Morfex*	lb.	.65	.67
2-MT	lb.	—	1.00
NA-22* (for neoprene)	lb.	—	1.00
NOBS No. 1*	lb.	.74	.76
Special*	lb.	.79	.81
O-X-A-F	lb.	.53	.55
Pentex*	lb.	—	1.04
Flour*	lb.	—	.26
Permalux (Neoprene)*	lb.	—	2.17
Phenex*	lb.	.52	.57
Polyac*	lb.	—	1.85
R-2 Crystals*	lb.	—	4.35
Rotax*	lb.	.53	.55
RZ-50-A*	lb.	—	1.00
B*	lb.	—	1.00
Santocure*	lb.	.74	.81
NS*	lb.	.79	.86
Selenac* (Ethyl, Methyl)	lb.	—	4.25
Seleram, Ethyl	lb.	—	4.25
Setsit-5*	lb.	.75	1.05
9*	lb.	.85	1.15
SPDX-GH*	lb.	.69	.71
GL*	lb.	1.20	1.30
Tellurac*	lb.	—	1.45
Tepidone*	lb.	.45	.48
Tetrone A*	lb.	—	1.91
Thiofide*	lb.	.52	.59
S*	lb.	.62	.69
Thionex*	lb.	—	1.14
Thiotax*	lb.	.42	.49
Thiram, Ethyl Methyl	lb.	—	1.04
Thiurad*	lb.	—	1.14
Thiuram E*	lb.	—	1.04
M*	lb.	—	1.14
Trimene*	lb.	.56	.58
Base*	lb.	1.03	1.06
Triphenyl Guanidine	lb.	—	.90
Tuads* (Ethyl)	lb.	—	1.04
Tuads* (Methyl)	lb.	—	1.14
Tuex*	lb.	—	1.14
Ultex*	lb.	1.00	1.10
Unads*	lb.	—	1.14
ZB*	lb.	—	.85
ZE*	lb.	—	.85
ZM*	lb.	—	.85
Vulcacure NB*	lb.	—	.45
Z-B-X*	lb.	—	2.45
Zenite*	lb.	.52	.54
A*	lb.	.62	.64
Zenite Special*	lb.	.53	.55
Zetax* (uncoated)	lb.	.53	.55
Zimate* (Butyl)	lb.	—	1.04
Zimate* (Ethyl)	lb.	—	1.04
Zimate* (Methyl)	lb.	—	1.04
Ziram, Butyl	lb.	—	1.04
50% Dispersion	lb.	.87	.89
Ziram, Ethyl	lb.	—	1.04
50% Dispersion	lb.	.87	.89
Ziram, Methyl	lb.	—	1.04
50% Dispersion	lb.	.87	.89

ACTIVATORS

Blue Lead Sublimed (dlvd.)	lb.	.17¼	.18¼
Cottonseed Fatty Acids			
Wochem 210*	lb.	—	.15¾
211*	lb.	—	.15¾
Fish Oil, Hydrogenated, Fatty Acid			
DAR-S* (dlvd.)	lb.	.11½	.13½
DAR-HY* (dlvd.)	lb.	.14¼	.16¼
Hydrofol Acids* (dlvd.)	lb.	.15¼	.17¼
Hyfac 430* (dlvd.)	lb.	.16¾	.18¾
Neo-Fat H.F.O.* (dlvd.)	lb.	.14½	.15¾
Neutrex* (dlvd.)	lb.	.15	.17
Stearex Beads* (dlvd.)	lb.	.09¾	.10¾
Stearite*	lb.	.12	.14
Talene* (dlvd.)	lb.	.15¼	.17¼
Lime, Hydrated			
Arrowhead*	ton	—	21.00
Marblehead*	ton	—	17.75
Sierra*	ton	—	22.50
Litharge			
Eagle-Picher* (c.l.)	lb.	.18	—
SB* (dlvd.)	lb.	—	.18½
Magnesium Oxide, Heavy			
General Magnesite 500*	lb.	.05½	.06
600*	lb.	.06½	.07
Kaiser 325*	lb.	.057	.073
Michigan No. 15*	lb.	.05½	.06½
Magnesium Oxide, Light			
Carey Mag*	lb.	.25¼	.26
General Magnesite* (neoprene grade)	lb.	.30	.32
General Magnesite No. 101*	lb.	.25¼	.26
Genmeg MLW*	lb.	.25¼	.26
K & M* (neoprene grade)	lb.	.29¼	.30

ACTIVATORS (Cont'd)

Magnesium Oxide, Light (cont'd)			
Light Calcined Magnesia			
No. X-01*	lb.	.25¼	.26
Maglite D*	lb.	.25¼	.26
L and M*	lb.	.29¼	.30
Michigan No. 30*	lb.	.25¼	.26
Neomag Powder*	lb.	.29¼	.30
Pellets*	lb.	.31¼	.32
Michigan No. 40*	lb.	.29¼	.30
Oleic Acid			
Emersol 210* (dlvd.)	lb.	.17¾	.18¾
Groco Red Oil	lb.	.13¾	.19¾
Neo-Fat 92-04*	lb.	.20½	.22½
94-04*	lb.	.18½	.20½
Wochem 310, 311	lb.	—	.18½
Palm Fatty Acids			
Groco 45*	lb.	.14¾	.16¾
Neo-Fat*	lb.	.15¾	.17¾
Wochem 280*	lb.	—	.14¾
281*	lb.	—	.15¼
Potassium Oleate (dms.)	lb.	.30	.73
Red Lead			
Eagle-Picher* (c.l.)	lb.	.19	—
No. 2 RM* (dlvd.)	lb.	—	.18½
Sodium Laurate, 75%	lb.	.64	.89
Sodium Oleate, 75%	lb.	.54	.79
Paste (dms.)	lb.	.39	.64
Sodium Stearate, 75%	lb.	.54	.89
Stearic Acid, Single Pressed			
Emersol 110* (dlvd.)	lb.	.14¾	.16¾
Groco 53*	lb.	.14¾	.16¾
Neo-Fat 18-53*	lb.	.14¾	.16¾
Standard Pearlstearic* (dlvd.)	lb.	.14¾	.16¾
Stearex B* (dlvd.)	lb.	.15½	.16¾
Wochem 730*	lb.	—	.11¼
Stearic Acid, Double Pressed			
Choice Pearlstearic* (dlvd.)	lb.	.15¼	.17¼
Emersol 120* (dlvd.)	lb.	.15¼	.17¼
Groco 54*	lb.	.15¼	.17¼
Hydrofol Acid 51RG	lb.	.11¼	.13¼
Neo-Fat 18-54*	lb.	.15¼	.17¼
Wochem 731*	lb.	—	.14¼
Stearic Acid, Other			
Extra Pearlstearic* (dlvd.)	lb.	.17½	.19½
Groco*	lb.	.12	.14
Neo-Fat 18*	lb.	.18½	.20½
18-58*	lb.	.14¼	.16¼
18-61*	lb.	.16¼	.18¼
Stearite*	lb.	.11¼	.13¼
Wochem 720*	lb.	—	.11½
721*	lb.	—	.11½
732*	lb.	—	.15¼
White Lead Basic Carbonate	lb.	.19	.20
White Lead Basic Sulfate	lb.	.17¼	.18¼
Zinc Laurate			
Laurex*	lb.	.33	.34
Zinc Stearate	lb.	.41	.46
Aquazinc K.C.*	lb.	.30	.55
Crown Brand*	lb.	.39	.44

Unclassified Activators

Actifat* (dms.)	lb.	—	.18
Aktone*	lb.	.21¼	.23¼
Barak*	lb.	—	.62
Curade*	lb.	.57	.59
Dibenzo G-M-F	lb.	—	2.60
D-B-A*	lb.	—	1.95
G-M-F*	lb.	—	2.60
Dibutylamine (dlvd.)	lb.	.55½	.56½
MODX*	lb.	.32½	.34½
Neo Fat 42-07*	lb.	.10¼	.12¼
Ridacto* (dms.)	lb.	.25	.26
Snodotte* (dlvd.)	lb.	.19	.21
Vulklor*	lb.	.88	.98

ANTI-COAGULANTS

Aqua Ammonia* (dms.)	lb.	.031	.035
M.B.M.C.* (l.c.l.)	lb.	.54	.76

ANTI-FOAMING AGENTS

Aero Anti Foam H*	lb.	—	.20
Regular*	lb.	—	.12
Anhydrol 6991*	lb.	.51	.56
D.C. Antifoam A*	lb.	5.45	6.65
Antifoam A Emulsion*	lb.	2.05	4.00
Antifoam AF Emulsion*	lb.	2.05	2.85
Defoama W-1701*	lb.	—	.12½
Defoamer A-25*	lb.	—	3.00
Defoamer 630*	lb.	—	.14
Deltyl Prime	lb.	.70	.80

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ANTI-FOAMING AGENTS (Cont'd)

G-E Antifoam SS-24*	lb.	5.30	-	6.65
SS-66*	lb.	5.30	-	6.65
60 Emulsion*	lb.	2.05	-	3.75
Igepol CO-210	lb.	——	-	.36
Kessco X-3* (dms.)	lb.	——	-	.35
X-180*	lb.	——	-	.29¼
X-181*	lb.	——	-	.38½
Nopco 1407*	lb.	.19½	-	.20½
1497-V*	lb.	.13¼	-	.14¼
1907-B*	lb.	.18¼	-	.19¼
JMK*	lb.	.48	-	.49
JMU*	lb.	.22½	-	.23½
JMY*	lb.	.19¼	-	.20¼
Pluronic L61*	lb.	.33½	-	.39
RS-968*	lb.	.38	-	.38½
Terpinol Prime No. 1	lb.	.35	-	.50
Tributyl Phosphate (dms.)	lb.	.52½	-	.53½

ANTIOXIDANTS

Agebest 1293-22A*	lb.	1.90	-	2.00
AgeRite Alba*	lb.	2.35	-	2.45
Gel*	lb.	.67	-	.69
Hipar*	lb.	1.00	-	1.02
H.P.*	lb.	.76	-	.78
Powder*	lb.	.55	-	.57
Resin*	lb.	.82	-	.84
Resin D*	lb.	.55	-	.57
Spar*	lb.	.55	-	.57
Stalite*	lb.	.55	-	.57
Stalite S*	lb.	.55	-	.57
Superlite*	lb.	.55	-	.57
White*	lb.	1.45	-	1.55
Akroflex C*	lb.	.81	-	.83
CD*	lb.	.76	-	.78
Aminox*	lb.	.55	-	.57
Antioxidant 425*	lb.	2.47	-	2.50
Antioxidant 2246*	lb.	1.50	-	1.53
Antox*	lb.	.55	-	.57
Aranox*	lb.	——	-	3.25
Benzoquinone	lb.	1.50	-	1.75
Betanox Special*	lb.	.85	-	.87
B-L-E*	lb.	.55	-	.57
B-X-A*	lb.	.55	-	.57
Deenax*	lb.	.95	-	1.05
Di-tert-Butyl-para-Cresol	lb.	.86	-	1.16
Eugenol C-95%*	lb.	2.30	-	2.50
Flectol H*	lb.	.55	-	.62
Flexamine*	lb.	.76	-	.78
Ionol* (dms.)	lb.	.91	-	.95
Neozone A*	lb.	.59	-	.61
C*	lb.	——	-	.83
D*	lb.	.55	-	.57
Nevastain A*	lb.	.51	-	.61
B*	lb.	.51	-	.70
Nullapon BF-12*	lb.	——	-	.21½
BF-13*	lb.	——	-	.25½
BF-78*	lb.	——	-	.55
BF-Acid*	lb.	——	-	.85
Octamine*	lb.	.55	-	.57
Oxidex*	lb.	——	-	3.60
PDA-10*	lb.	.46	-	.48
Permalux*	lb.	——	-	2.17
Polygard*	lb.	.55	-	.57
Santoflex AW*	lb.	.78	-	.85
DD*	lb.	.55	-	.62
75*	lb.	.97	-	1.04
Santovar-A*	lb.	1.50	-	1.57
Santowhite Crystals*	lb.	1.55	-	1.62
Santowhite L*	lb.	.55	-	.62
MK*	lb.	1.25	-	1.32
Powder*	lb.	1.55	-	1.62
Sequestrene AA*	lb.	.76	-	.85
NA2*	lb.	.62	-	.70
NA3*	lb.	.61	-	.69
Stabilite*	lb.	.55	-	.57
Alba*	lb.	.72	-	.77
FLX*	lb.	——	-	.65
L*	lb.	.60	-	.62
White*	lb.	.52	-	.54
White Powder*	lb.	.41	-	.43
Stabilizer No. 1*	lb.	1.55	-	1.80
Stabilizer No. 9-A*	lb.	.80	-	1.05
Styphen I*	lb.	.51	-	.55
Sunolite*	lb.	.16	-	.22
Tannic Acid, Tech.	lb.	.46	-	.48
Thermoflex A*	lb.	1.00	-	1.02
V-G-B*	lb.	.75	-	.77
Wing-Stay S*	lb.	.53	-	.57

ANTI-SCORCHING AGENTS

Armeen HT*	lb.	.34	-	.40
Good-rite Vultrol*	lb.	.62	-	.64
Harcopol 1183*	lb.	.70	-	.74
Retarder PD*	lb.	.37	-	.39
W*	lb.	——	-	.42
Sodium Acetate 60-62% Crystals	lb.	.08	-	.08½

ANTISEPTICS AND GERMICIDES

A.P.C. 6901*	lb.	.32	-	.38
Arquad S*	lb.	.38	-	.44
Formaldehyde (dms.)	lb.	.06	-	.076
G-4* (bbls.)	lb.	1.09	-	1.29
G-11*	lb.	1.98	-	2.08
Halane*	lb.	.40	-	.47
Ortho Cresol (26°—27°)	lb.	.14	-	.16¼
Preventol GD	lb.	——	-	1.09
Retarder D*	lb.	.42	-	.50
Vancide	lb.	——	-	.80

ANTI-WEBBING AGENTS (for Latex)

DC 7 Compound*	lb.	5.13	-	6.50
Webnix 34-L*	lb.	1.25	-	1.75
69-C*	lb.	1.50	-	2.25

AROMATICS (DEODORANTS)

Airkem 115*	gal.	——	-	6.50
122*	gal.	——	-	6.50
186*	gal.	——	-	6.50
Alamask AA*	lb.	——	-	3.00
AF*	lb.	——	-	2.50
AO*	lb.	——	-	1.50
AR*	lb.	——	-	.50
BG*	lb.	——	-	1.15
BGM*	lb.	——	-	.60
CY*	lb.	——	-	2.40
DJ*	lb.	——	-	3.35
DL*	lb.	——	-	1.95
H*	lb.	——	-	5.50
LD*	lb.	——	-	.75
ND*	lb.	——	-	2.75
O*	lb.	——	-	6.50
OS*	lb.	——	-	5.25
Bouquet 149*	lb.	——	-	3.00
Coumarin*	lb.	3.60	-	3.70
Curodex 19*	lb.	4.75	-	4.90
188*	lb.	5.75	-	5.90
198*	lb.	6.75	-	6.90
Deodorant 65*	lb.	——	-	1.85
Deodorant L-37*	lb.	2.15	-	2.25
L-44*	lb.	2.65	-	2.75
N.L.T.X.*	lb.	1.90	-	2.00
Deodorant Oil GD 6422*	lb.	1.90	-	2.20
GD 6423*	lb.	1.60	-	1.90
GD 6575*	lb.	2.40	-	2.90
GD 31063*	lb.	2.25	-	2.75
Ethavan*	lb.	6.20	-	6.25
Latex Perfume 17326	lb.	——	-	4.00
18301	lb.	——	-	3.00
22258	lb.	——	-	2.50
Naugaromes* (dms.)	lb.	.60	-	3.00
Neutroleum Delta*	lb.	——	-	2.60
Gamma*	lb.	——	-	3.60
Parador A*	lb.	1.80	-	2.10
C*	lb.	2.00	-	2.50
E*	lb.	.25	-	.40
GD 5280*	lb.	2.00	-	2.50
GD 53481*	lb.	1.70	-	2.00
Perfume Oil Bouquet Vanilla M*	lb.	1.60	-	1.70
Rodo No. 0*	lb.	4.00	-	4.50
No. 10*	lb.	5.00	-	5.50
Rubbarome* (dms.)	lb.	.60	-	3.80
Rubber Perfume 12*	lb.	——	-	4.35
Russian Leather 7*	lb.	——	-	4.35
Vanillin	lb.	2.75	-	2.80

BLOWING AGENTS

Ammonium Bicarbonate	cwt.	——	-	8.00
Better Blend Soda* (c.l., bags)	cwt.	——	-	2.55
Blowing Agent CP-975*	lb.	.32	-	.35
Celogen*	lb.	——	-	1.95
AZ*	lb.	——	-	1.95
Diazo Amino Benzene	lb.	——	-	.73
Neo Fat 42-12*	lb.	.10¼	-	.12¼
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	——	-	2.40
Sponge Paste*	lb.	——	-	.20
Unicel ND*	lb.	——	-	.76
S*	lb.	——	-	.20
Urea	lb.	.06	-	.07

BONDING AGENTS

Base 6986*	lb.	.27	-	.32
Braze*	gal.	6.00	-	9.00
Cover Cement*	gal.	2.50	-	4.00
Durez 12987*	lb.	——	-	.54
Gen-Tac Latex*	lb.	.70	-	.75
Hylene M*	lb.	3.50	-	3.75
M-50*	lb.	1.90	-	2.15
Penacolite B1A*	lb.	——	-	.95
R-2710*	lb.	——	-	.95
Pliobond 20*	gal.	2.91	-	4.23
30*	gal.	3.65	-	4.97
Rex Compounds*	gal.	1.30	-	1.90
Thixons*	gal.	3.30	-	9.00
Ty-Ply Q (BN & S)*	gal.	6.75	-	8.00
Tygobond 30*	gal.	5.50	-	7.45
Vinculux	gal.	——	-	4.95

COAGULANTS

Acetic Acid—56% (bbls.)	cwt	9.00	-	11.00
Glacial 99½% (dms.)	lb.	.12	-	.13
Calcium Nitrate, Tech. Flake	lb.	.12½	-	.15
Hydroxyacetic Acid—70% (dms.)	lb.	——	-	.095
Zinc Nitrate, Tech. Flake	lb.	——	-	.20

COLORING AGENTS

Black

Aquablak B*	lb.	.09¾	-	.10¼
M*	lb.	.10½	-	.11
R*	lb.	.10¾	-	.11¼
S*	lb.	.11¾	-	.12¼
Black Shield 4-35* (dms)	lb.	.09	-	.09½
No. 5	lb.	.10	-	.10½
No. 6	lb.	.09	-	.09½
L-1404B	lb.	.10½	-	.11
Carbon Black—See *Reinforcing Agents*				
Cooke 1026*	lb.	——	-	2.50
Lampblack No. 10*	lb.	.06	-	.09
Mapico Black Iron Oxide* (50 lb. bags)	lb.	.14¼	-	.14½
Pure Black Iron Oxide	lb.	.14¼	-	.14½

COLORING AGENTS (Cont'd)

Blue

Akron Masterbatches*	lb.	2.23	-	2.78
Toners*	lb.	2.30	-	6.35
Blue Powders	lb.	2.20	-	3.75
Cooke M.B. Blue*	lb.	2.20	-	3.75
Monastral Rubber Blue CPL*	lb.	——	-	1.95
PCD, Dispersed*	lb.	——	-	2.20
Peacoline Blue*	lb.	——	-	3.85
Ramapo Blue*	lb.	2.75	-	3.00
Rubber Blue GD* (Disp.)	lb.	——	-	4.75
Rubber Blue X-1999*	lb.	——	-	1.90
Rubber Dispersed Blues	lb.	2.52	-	2.78
Solfast Sky Blue*	lb.	3.00	-	3.60
Syntheline Blue*	lb.	——	-	3.85
Stan-Tone MBS*	lb.	1.55	-	4.55
GPE*	lb.	——	-	2.50
PC*	lb.	1.40	-	1.80
Ultramarine	lb.	.14	-	.30
Vansul Blue M.B.*	lb.	.95	-	2.60

Brown

Brown Iron Oxide	lb.	.15¼	-	.15½
Mapico Brown* (50 lb. bags)	lb.	.15¼	-	.15½
Stan-Tone GPE*	lb.	——	-	3.00
Vansul Brown M.B.* (Organic)	lb.	——	-	2.15

Green

Akron Masterbatches*	lb.	1.38	-	3.08
Toners*	lb.	1.35	-	4.95
Cooke M.B. Green*	lb.	1.60	-	2.80
1013*	lb.	——	-	2.80
Filo Green*	lb.	——	-	.34
Green Powders	lb.	1.35	-	3.95
Monastral Rubber Green GSD* (Dispersed)	lb.	——	-	2.66
GSL*	lb.	——	-	2.20
Permansa Green CP-594*	lb.	——	-	1.35
Pigment Green B*	lb.	——	-	1.35
GL-652D*	lb.	.90	-	1.00
Ramapo Green*	lb.	——	-	3.50
Rubber Dispersed Greens	lb.	1.23	-	3.08
Rubber Green FD* (Disp.)	lb.	——	-	2.05
Rubber Green X-1292*	lb.	——	-	1.65
Solfast Green*	lb.	——	-	3.95
Stan-Tone MBS*	lb.	1.55	-	3.35
GPE*	lb.	3.00	-	4.50
PC*	lb.	1.70	-	3.80
Vansul Green M.B.*	lb.	1.05	-	2.90

Maroon

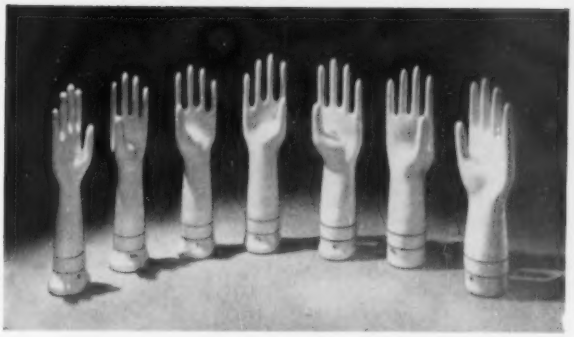
Akron Masterbatches*	lb.	——	-	4.10
Toners*	lb.	2.00	-	4.00
Maroon Powders	lb.	.79	-	3.60
Pyrolux Maroon*	lb.	——	-	3.65
Vansul Maroon M.B.*	lb.	——	-	3.35

Orange

Akron Masterbatches'	lb.	2.42	-	2.77
Toners*	lb.	2.82	-	4.00
Benzidene Orange	lb.	——	-	3.00
Cooke MB*	lb.	2.25	-	2.35
1021*	lb.	——	-	2.25
Mercadium X-2667*	lb.	——	-	1.78
Molybdate Orange	lb.	.46½	-	.48
Oswego Orange X2065*	lb.	——	-	3.15
Rubber Orange OD* (Disp.)	lb.	——	-	2.25
Solfast Orange*	lb.	——	-	2.25
Stan-Tone Cadmium Dry*	lb.	2.10	-	2.20
Cadmium Paste*	lb.	2.47	-	3.20
GPE*	lb.	1.20	-	4.35
PC*	lb.	.75	-	2.75
Vansul Orange M.B.*	lb.	2.40	-	2.45

Red

Akron Masterbatches*	lb.	1.00	-	3.53
Toners*	lb.	.88	-	5.60
Arcturus Reds*	lb.	——	-	1.13
Antimony Trisulfide	lb.	.72	-	.78
R.M.P. Sulfur Free*	lb.	——	-	.78
R.M.P. No. 3*	lb.	——	-	.72
Brilliant Toning Reds*	lb.	1.65	-	1.95
Cadmolith Red* (dms.)	lb.	2.11	-	3.40
Cooke M.B. Red*	lb.	1.05	-	3.25
1010*	lb.	——	-	1.75
Graphic Red (dlvd.)	lb.	.88	-	.93
Kroma Reds*	lb.	.14	-	.15
Lake Red C*	lb.	——	-	1.13
Mapico Reds* (50 lb. bags)	lb.	.13¾	-	.14
Mercadium X-2668 Light*	lb.	——	-	1.95
X-2669 Medium Light*	lb.	——	-	2.10
X-2670 Medium*	lb.	——	-	2.25
X-2671 Dark*	lb.	——	-	2.40
Oximony Red Iron Oxide	lb.	.12¾	-	.13
Plasticone Reds*	lb.	——	-	4.60
Polaris Red*	lb.	——	-	1.65
Recco Red Oxide*	lb.	.12	-	.13
Red Iron Oxide, Light	lb.	.13¾	-	.14
Red Powders	lb.	——	-	4.40
Rubber Dispersed Reds	lb.	1.47	-	3.58
Rubber Red PBD* (Disp.)	lb.	——	-	1.90
2BD, Dispersed*	lb.	——	-	1.80
2BL*	lb.	——	-	1.24
PBL*	lb.	——	-	1.24
Rubanox Reds*	lb.	1.40	-	1.50
Rubber Red CP-339* (dlvd.)	lb.	——	-	1.10
Rubber Red X-1148*	lb.	——	-	.93
Solfast Red*	lb.	1.40	-	1.50
Stan-Tone MBS*	lb.	1.20	-	3.53
GPE*	lb.	1.65	-	2.00
PC*	lb.	1.30	-	2.50
PDS*	lb.	1.40	-	1.55
PVC*	lb.	1.65	-	1.90
Vansul Red M.B.*	lb.	1.00	-	3.35
Watchung Red*	lb.	1.65	-	1.95



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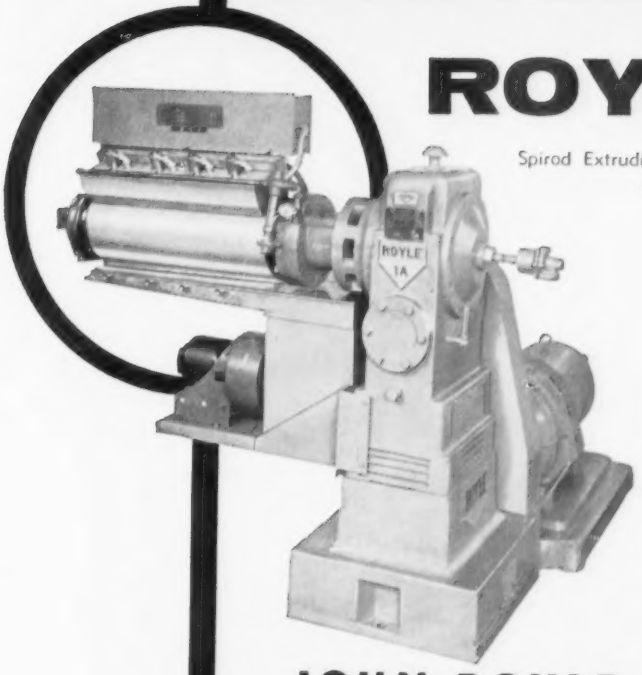

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PATERSON 3, NEW JERSEY

COLORING AGENTS (Cont'd)

Tan

Mapico Tan 15* (50 lb. bags)	lb.	.22¾ -	.2300
20* (50 lb. bags)	lb.	.22¾ -	.2300

White—Lithopone

Eagle-Picher*	lb.	.0800 -	.0975
Permolith*	lb.	.0800 -	.0875
Sunolith*	lb.	.0800 -	.0875

White—Titanium Pigments

Horse Head Anatase Grades*	lb.	.25½ -	.26½
Rutile Grades*	lb.	.25½ -	.26½
Stan-Tone PC*	lb.	—— -	.55
Ti-Cal*	lb.	.09 -	.09¼
R-25*, R-25*, R-27*, R-30*	lb.	.09¼ -	.09⅞
R-60*	lb.	.09¼ -	.10⅛
Ti-Pure*	lb.	.24½ -	.27½
Anatase Grades*	lb.	.25½ -	.26½
Rutile Grades*	lb.	.27½ -	.28½
Titanox A*—all grades (dlvd.)	lb.	.24½ -	.25½
C-50* (dlvd.)	lb.	.13⅜ -	.14⅜
RA* (dlvd.)	lb.	.26½ -	.27½
RA-10* (dlvd.)	lb.	.26½ -	.27½
RA-NC* (dlvd.)	lb.	.26½ -	.27½
RC* (dlvd.)	lb.	.09¼ -	.09¾
RC-HT* (dlvd.)	lb.	.09 -	.09½
Unitane O-110*	lb.	.25½ -	.26½
O-220*	lb.	.25½ -	.26½
O-310*	lb.	.25½ -	.26½
O-410*	lb.	.25½ -	.26½
OR-150*	lb.	.27½ -	.28½
OR-250*	lb.	.27½ -	.28½
OR-340*	lb.	.27½ -	.28½
OR-342*	lb.	.27½ -	.28½
OR-350*	lb.	.27½ -	.28½
OR-540*	lb.	.27½ -	.28½
OR-640*	lb.	.27½ -	.28½
Zopaque*	lb.	.24½ -	.25½
R*	lb.	.26½ -	.27½

White—Zinc Oxide (American Process)

AZO-DOX 44, 45	lb.	.1450 -	.1550
AZO-ZZZ 11* (22*, 33*, 44*, 55*)	lb.	.1450 -	.1550
Eagle-Picher AAA*	lb.	.1450 -	.1550
Horse Head Special*	lb.	.1450 -	.1550
XX*	lb.	.1450 -	.1550
Protox 166*	lb.	.1450 -	.1550
167*	lb.	.1450 -	.1550
267* (pelleted)	lb.	.1450 -	.1550
St. Joe Black Label*	lb.	.1450 -	.1550
Green Label*	lb.	.1450 -	.1550
Red Label*	lb.	.1450 -	.1550
Pelleted	lb.	.1450 -	.1550

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	—— -	.13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.1450 -	.1550
Florence Green Seal*	lb.	.1625 -	.1725
Red Seal*	lb.	.1575 -	.1675
White Seal*	lb.	.1675 -	.1775
Kadox 25*	lb.	.1675 -	.1775
15*, 17*, 72* & 515*	lb.	.1450 -	.1550
Protox 168*	lb.	.1450 -	.1550
169*	lb.	.1450 -	.1550
268* (pelleted)	lb.	.1450 -	.1550
U.S.P. (cartons)	lb.	.1775 -	.1875
XX-78*	lb.	.1450 -	.1550

White—Zinc Sulfide

Cryptone ZS*	lb.	.2530 -	.2630
Lehigh 35%*	lb.	.1550 -	.1650
50%*	lb.	.1585 -	.1685

Yellow

Akron Masterbatch*	lb.	1.12 -	2.18
Toners*	lb.	2.10 -	6.00
Benzidene-Lightfast	lb.	2.75 -	3.50
Benzidine Yellow	lb.	2.35 -	2.45
Cadmolith Yellow† (dms.)	lb.	1.12 -	1.20
Chrome Yellow	lb.	.32½ -	.35
Cooke M.B. Yellow 405*	lb.	2.15 -	2.75
105*	lb.	—— -	2.15
Iron Oxide, Pure Light Shades	lb.	.12 -	.12¼
Dark Shades	lb.	.11½ -	.11¾
Mapico Yellow* (50 lb. bags)		.12 -	.12¼
Rubber Dispersed Yellows	lb.	1.27 -	2.13
Rubber Yellow GD* (disp.)	lb.	—— -	2.25
GL*	lb.	—— -	1.68
Rubber Yellow X-1940*	lb.	—— -	2.35
Stan-Tone Cadmium Dry*	lb.	2.80 -	3.03
Cadmium Paste*	lb.	1.63 -	1.99
MBS*	lb.	1.30 -	2.20
GPF*	lb.	4.25 -	4.50
PC*	lb.	.55 -	3.40
Sumatra Yellow X-1940*	lb.	—— -	2.45
Toluidine Yellow	lb.	2.00 -	2.10
YL-660 D*	lb.	1.25 -	1.35
Oximony Iron Oxide	lb.	.12¼ -	.13
Vansul Yellow M.B.*	lb.	1.00 -	2.00
Yellow Powders	lb.	2.00 -	5.00
Zinc Yellow	lb.	.27½ -	.29

DISPERSING AGENTS

Anchoid*(†)	lb.	.24 -	.25
Anhydrapent*	lb.	.56 -	.59
Armeen 18*	lb.	.39 -	.45
Blancol*	lb.	—— -	.15¼
Darvan No. 1* (and No. 2*)	lb.	.22 -	.30
Daxad 11* (21*, 23*)	lb.	.08 -	.30
Diethanolamine (dms., dlvd.)	lb.	.24½ -	.27½
Dispersaid*	lb.	1.25 -	1.35
Emcol K-8300* (dms.)	lb.	.14 -	.18
P10-59	lb.	.32 -	——
5120	lb.	.31 -	——
5138	lb.	.31 -	——
Emulphor ON-870*	lb.	—— -	.55
Furala*	lb.	.06½ -	.07½
Halloid*	lb.	.04½ -	.05½
Hyeryl A-1000*	lb.	.09 -	.09½
Igepal CO-630*	lb.	—— -	.29
Igepon T-73*	lb.	—— -	.29½
Kyro EO* (dms.)	lb.	—— -	.29¾
Leonil SA*	lb.	—— -	.55
Lomar PW*	lb.	—— -	.18
Marasperse C*	lb.	.06¼ -	.06¾
CB*	lb.	.13 -	.15
N*	lb.	.09½ -	.10½
Monoethanolamine (dms., dlvd.)	lb.	.25 -	.28
Naccotan A*	lb.	.16½ -	.17
Nekal BA-75*	lb.	—— -	.40
BX-78*	lb.	—— -	.64
Nopco 1187-X*	lb.	.15 -	.16
Pluronic F68*	lb.	.38½ -	.44
Polyfon*	lb.	.08 -	.09
R & R 551*	lb.	—— -	.28
Rubbex*	lb.	.247 -	.277
Stablex B*	lb.	.50 -	.95
Stan-Chem BQC*	lb.	.12¼ -	.17¼
1067*	lb.	—— -	.13½
1471*	lb.	.1687 -	.2187
2251*	lb.	.12¼ -	.17¼
Trenamine D-25*	lb.	.32½ -	.36
Triethanolamine (dms., dlvd.)	lb.	.22 -	.25
Yelkin TT* (and TTS*)	lb.	.13 -	.16

EXTENDERS

Arco 1071-13B*	lb.	.14½ -	.15½
1073-18B*	lb.	.13½ -	.14½
1294-36B*	lb.	.11½ -	.12½
Car-Bel-Ex-A* (and B*)	lb.	—— -	.14
Extender 600*	lb.	—— -	.1765
Facile Gum 4A*	lb.	.48 -	.50
Millex*	lb.	—— -	.07
W*	lb.	—— -	.07
Nopco 2271*	lb.	.15½ -	.16½
Polyco 418*	lb.	.17 -	.18
PR-162 Latex Extender*	lb.	—— -	.182
Solvitose HDF*	lb.	.22 -	.25
Synprolac*	lb.	.16 -	.23
Synprowax*	lb.	—— -	.23
Vistanex MM Grades*	lb.	—— -	.35

FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite*	lb.	.21½ -	1.35
Lionite*	lb.	.16 -	1.27
Pumice	lb.	.03 -	.05
Walnut Shell Grits	lb.	.05 -	.08
Aluminum Hydrate	lb.	.0850 -	.1200
Kaiser Alumina*	lb.	.026 -	.059
Aluminum Silicate			
AFD*	ton	26.50 -	60.00
Aluminum Flake*	ton	23.50 -	32.50
Marter White*	ton	18.50 -	30.00
Barium Carbonate (l.c.l.)	ton	95.50 -	100.00
Barytes			
No. 1 Floated, White*	ton	45.00 -	65.10
No. 2 Floated, Unbleached*	ton	43.00 -	63.10
No. 22 Barytes* (c.l.)	ton	—— -	30.00
No. 3805 Barytes*	ton	22.00 -	26.75
Foam A*	ton	—— -	45.00
Sparmite*	ton	80.00 -	85.00
XIOR*	ton	80.00 -	85.00
Bentonite (c.l.)	ton	—— -	13.50
Argosite Clay* (c.l.)	ton	—— -	12.50
Bennett Clay* (c.l.)	ton	—— -	32.50
SPV Volclay* (c.l.)	ton	—— -	12.50
White Hi-Gel*	ton	—— -	65.90
Blanc Fixe	ton	72.50 -	120.00
Calcium Carbonate			
Atomite* (c.l.)	ton	—— -	32.50
B.I. White No. 1 (c.l.)	ton	—— -	9.00
Caleene NC*	ton	72.50 -	92.50
TM*	ton	75.00 -	95.00
Calwhite*	ton	—— -	20.00
Camel-Carb*	ton	—— -	12.00
Camel-Tex*	ton	—— -	20.00
Camel-Wite*	ton	—— -	32.50
Duramite*	ton	—— -	20.00
Gamaco* (c.l.)	ton	—— -	32.50
Georgia Marble 5-25* (c.l.)	ton	—— -	20.00
No. 10 White* (c.l.)	ton	—— -	11.00
Kalite*	ton	50.00 -	65.00
Laminar*	ton	—— -	30.00
Lesumite* (c.l.)	ton	—— -	27.50
Lorite*	ton	30.00 -	36.00
Millical*	ton	38.00 -	53.00
Multifex MM*	ton	110.00 -	125.00
Non-Fer-Al*	ton	32.50 -	37.50
Purecal M*	ton	56.75 -	80.75
SC* (and T*)	ton	110.00 -	125.00
U*	ton	120.00 -	135.00

FILLERS (Cont'd)

Calcium Carbonate (cont'd)			
Rambo No. 1*	ton	—— -	10.50
Snowflake*	ton	17.00 -	20.00
Super Multifex*	ton	160.00 -	175.00
Surfex*	ton	37.50 -	52.50
Suspenso*	ton	35.50 -	50.50
Witcarb Reg.*	ton	56.75 -	85.00
P*	ton	110.00 -	140.00
R*	ton	120.00 -	150.00
RC*	ton	110.00 -	140.00
York White*	ton	—— -	10.50
Calcium Silicate Silene EF*	ton	120.00 -	140.00
Calcium Sulfate, Anhydrous Snow White Filler*	ton	—— -	21.00
Calcium Sulfate Hydrous Terra Alba No. 1*	ton	—— -	17.00
Chalk Whiting (l.c.l.)	lb.	.01½ -	.01¾
Recco Paris Whiting*	ton	—— -	35.00
OMYA Whiting*	ton	—— -	30.00
Clay			
Afton Clay*	ton	12.00 -	35.50
Aiken Clay*	ton	—— -	13.00
Alsilite* (c.l.)	ton	30.00 -	45.00
Aluminum Flake*	ton	23.50 -	30.00
Buca* (c.l.)	ton	—— -	45.00
Burgess No. 20*	ton	—— -	35.00
No. 30*	ton	—— -	37.00
Burgess Iceberg*	ton	—— -	50.00
Catalpo* (c.l.)	ton	—— -	35.00
Champion*	ton	—— -	14.00
Crown*	ton	—— -	14.00
Dixie* (c.l.)	ton	—— -	14.00
Franklin Clay—R* (c.l.)	ton	15.00 -	39.00
G. K. Soft*	ton	11.00 -	28.00
Harwick Clays*	ton	14.50 -	57.00
Hi-White R*	ton	—— -	13.50
Kaolloid Clay* (c.l.)	ton	—— -	10.50
LGB*	ton	—— -	17.00
LGP*	ton	—— -	19.00
McNamee* (c.l.)	ton	—— -	13.50
Natka 1200 (c.l.)	ton	—— -	12.00
Par* (c.l.)	ton	—— -	12.00
Paragon*	ton	—— -	13.50
Pigment 5*	ton	23.50 -	26.50
33*	ton	—— -	37.00
Recco* (c.l.)	ton	—— -	14.00
Swanee Clay*	ton	—— -	12.50
Snobrite*	ton	—— -	12.50
Suprex*	ton	—— -	14.00
Whitetex* (c.l.)	ton	—— -	50.00
4200 Clay*	ton	—— -	11.00
Diatomaceous Earth	ton	30.00 -	50.00
Kaylorite* (c.l.)	ton	—— -	30.00
Lorite*	ton	—— -	30.00
Flock			
Cotton (White)	lb.	.28 -	.32
Colored	lb.	.11 -	.13½
Filfloc F 40-9000*	lb.	—— -	.13
F 6000*	lb.	—— -	.36
Polycel*	ton	110.00 -	210.00
Rayon, Bleached or Dyed	lb.	.75 -	1.20
Rayon, Grey	lb.	—— -	.18
Rayon, Pink	lb.	—— -	.20
Solka-Floc* (l.c.l.)	lb.	.07 -	.16
Glue, Amber	lb.	.17 -	.19
Ground Softwood Bark Silvacon* (c.l.)	ton	55.00 -	100.00
Leather			
Flour (dust)	lb.	.12 -	.15
Shredded	lb.	.05 -	.17
Lignin	lb.	.06 -	.08
Indulin*	lb.	.06 -	.08
Limestone, Pulverized	ton	3.00 -	5.00
Asbestol Regular*	ton	27.00 -	29.00
Asbestol Superfine*	ton	32.00 -	34.00
Georgia Marble No. 10*	ton	—— -	11.00
Industrial Filler No. 100*	ton	—— -	5.75
Micro Velva A*	ton	49.00 -	51.00
L*	ton	57.00 -	59.00
No. 1 White*	ton	—— -	10.00
Magnesium Carbonate	lb.	.12½ -	.15
E & M Clearcarb*	lb.	—— -	.14
Technical* (c.l., eqld.)	lb.	.10½ -	.12
Marinco CL*	lb.	—— -	.1[illegible]
Magnesium Silicate (see Talc)			
Mica	lb.	.01¼ -	.07¼
Concord*	lb.	.08 -	.08¼
Micro-Mica*	lb.	.08 -	.08¼
Mineralite* (c.l.)	ton	40.00 -	85.00
Silversheen*	lb.	.08 -	.08¼
Triple A Mica* (c.l.)	ton	—— -	30.00
Vermiculite*	lb.	—— -	.11
Wet Ground Biotite Mica	lb.	.06½ -	.07¼
Wet Ground Mica No. 160*	lb.	.08 -	.08¼
Pecan Shell Flour Stan Shell*	ton	45.00 -	75.00
Pyrophyllite			
No. 261*	ton	—— -	11.50
Pyrax A* (c.l.)	ton	—— -	13.50
WA* (c.l.)	ton	—— -	16.00
Sawdust, Graded	ton	14.00 -	35.00
Silica	ton	16.00 -	27.00
Extra Fine (bags) (c.l.)	ton	—— -	43.00
Slate, Powdered (l.c.l.)	ton	15.00 -	20.00
Lo-Micron Slate Flour*	lb.	—— -	.04½
No. 133 Slate Flour*	ton	—— -	4.55
Sodium Silico Aluminate Zeolex 23*	ton	120.00 -	140.00

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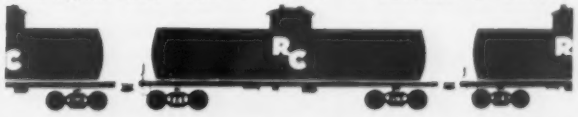

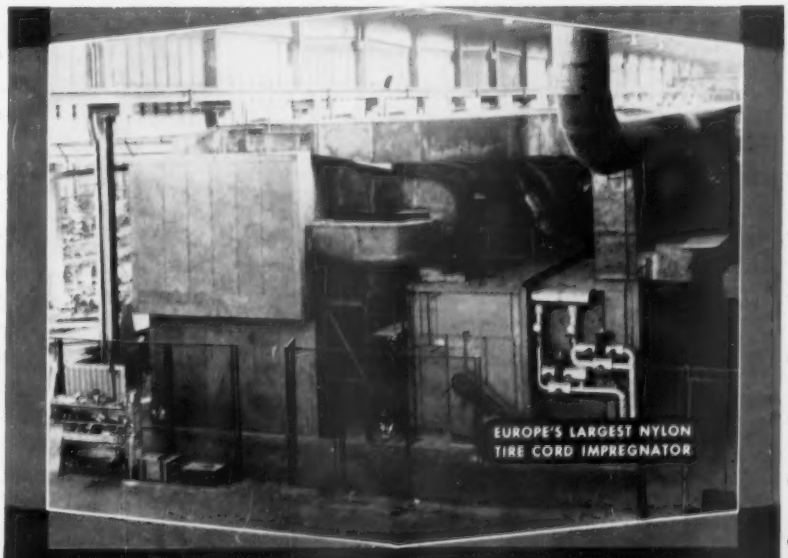

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FILLERS (Cont'd)

Talc (Magnesium Silicate)			
Asbestos Regular*	ton	—	27.00
Eastern RC-500*	ton	—	32.00
No. 41*	ton	—	19.70
No. 549*	ton	—	63.00
French*	ton	—	59.00
L.S. Silver*	ton	33.75	38.75
No. 367*	ton	—	13.00
No. 1600*	ton	—	70.60
No. 1768*	ton	—	13.00
Nytal 200* (c.l.)	ton	—	28.00
300* (c.l.)	ton	—	38.00
Sierra Fibrene C-400*	ton	33.00	38.00
Supreme 325*	ton	46.25	57.25
Sierra White*	ton	20.75	31.75
Soapstone*	ton	—	13.00
Walnut Shell Flour	ton	$5.00	-100.00
Stan-Shell*	ton	50.00	84.00
Whiting, Commercial	ton	—	7.50
Allied Whiting*	ton	10.50	21.50
Camel-Carb*	ton	—	10.00
Calwhite (c.l.)	ton	—	20.00
C-C-O White*	ton	20.00	22.50
Georgia Marble No. 15*	ton	—	20.00
No. 16*	ton	—	20.00
Piqua No. 1 YAA* (c.l.)	ton	1.00	10.00
No. 2 LS* (c.l.)	ton	1.00	10.00
Snowflake* (c.l.)	ton	—	20.00
Stan-White 325*	ton	11.50	14.10
Veroc* (c.l.)	ton	—	10.50
Welco* (c.l.)	ton	—	10.50
York White R* (c.l.)	ton	—	10.00
Wood Flour	ton	31.50	48.00

FINISHING MATERIALS, SURFACE

Beaco Finishes*	gal.	2.10	2.35
Black Out*	gal.	4.50	8.00
Shellac, Orange Gum	lb.	.50	.60
VanWax*	gal.	1.45	1.50

FLAME RETARDANTS

Celluflex CEF* (dms.)	lb.	—	.65
Chlorowax 40*	lb.	.15¼	.17¼
50*	lb.	.16¾	.17¾
70*	lb.	.18½	.20
Halowax*	lb.	.36	.46
Zinc Borate 3167*	lb.	.1920	.2020
Zyrox Compounds*	lb.	.38	.95½

LATEX MODIFIERS

Ludox	lb.	.15	.16¾
OPD-101*	lb.	—	.28
Piccopale A-1 Emulsion	lb.	.086	.107
Ubatol U-2091* (dms.)	gal.	1.84	1.87

LUBRICANTS, MOLD

Akro Gel*	lb.	—	.165
Alipal CO-433*	lb.	—	.20
CO-436*	lb.	—	.24
Aluminum Stearate Crown Brand*	lb.	.37	.42
Amine, Mixed Crude*	lb.	.19	.25
Aquadag*	lb.	3.50	4.00
Aquarex D*	lb.	—	.78
E*	lb.	—	.94
ME*	lb.	—	.80
MDL*	lb.	—	.33
WAQ*	lb.	—	.22
Armeen HT*	lb.	.34	.40
180*	lb.	.52	.56
Armid HT (flaked)*	lb.	.42	.46
0*	lb.	.39	.41
Borax, Granular (l.c.l.)	ton	89.00	94.00
Carbowax 4000*	lb.	.31	.32
CD Mold Release B*	gal.	5.00	—
B-2*	gal.	5.00	—
Colite Concentrate* (dms.)	gal.	.90	1.15
Colite D43D*	gal.	1.15	1.40
Concentrex*	lb.	—	.25
Dag Dispersions No. 197*	lb.	1.85	2.90
D.C. 7 Compound*	lb.	5.13	6.50
D.C. Emulsion No. 7*	lb.	1.59	2.07
No. 8*	lb.	1.22	1.76
No. 35*	lb.	1.22	1.76
No. 35A*	lb.	1.22	1.76
No. 35B*	lb.	1.22	1.76
No. 36*	lb.	1.22	1.76
D.C. Mold Release Fluid*	lb.	3.14	4.75
Dri-Lube*	lb.	—	.22
Emulsion Lubricant A80*	lb.	—	1.80
45*	lb.	—	1.80
G-E Silicone Emulsion SM-55*	lb.	1.22	1.76
SM-61*	lb.	1.22	1.76
SM-62*	lb.	1.22	1.76
G-E Silicone Fluid SF-93*	lb.	3.14	4.25
SF-96*	lb.	3.14	4.25
Glydag G*	lb.	1.30	2.45
Hawkeye Flake* (dlvd.)	lb.	.15	.15¾
HSC No. 35*	lb.	1.22	2.46
No. 515	lb.	1.22	2.46
Igepal CO-430*	lb.	—	.29
CO-630*	lb.	—	.29
CO-530*	lb.	—	.29
Igepon AP-78*	lb.	—	.48
T-33*	lb.	—	.21
T-51*	lb.	—	.13½

LUBRICANTS, MOLD (Cont'd)

Kokobace R*	lb.	.17½	.18½
Lubrex	lb.	.25	.30
Lubri-Flo*	gal.	10.00	12.00
Migralube*	lb.	—	.35
ML-1027-2C*	gal.	—	2.15
ML-1028-2C*	gal.	—	2.15
Mold Lubricant No. 72 Conc.* (dms.)	gal.	—	1.90
No. 735* (dms.)	gal.	—	1.25
No. 769* (dms.)	gal.	—	1.20
No. 825* (dms.)	gal.	—	2.00
No. 856* (dms.)	gal.	—	1.90
No. 880* (dms.)	gal.	—	1.19
No. 887* (dms.)	gal.	—	1.80
No. 896* (dms.)	gal.	—	1.28
No. 935* (dms.)	gal.	—	1.56
No. 956* (dms.)	gal.	—	2.50
No. 965* (dms.)	gal.	—	2.15
No. 967* (dms.)	gal.	—	2.40
No. 969* (dms.)	gal.	—	1.50
No. 975* (dms.)	gal.	—	2.85
No. 980* (dms.)	gal.	—	1.53
No. 987* (dms.)	gal.	—	2.45
Moldeze No. 3*	gal.	—	4.95
Mold-Brite*	gal.	—	1.50
Monopole Oil MD*	lb.	—	.16
Olate Flakes*	lb.	.22	.23
Orvus WA Paste* (dms.)	lb.	—	.22
Plaskon Polyethylene S*	lb.	.32	.47
Polyglycol 15-200*	lb.	.25	.28¼
E4000*	lb.	.31	.37
Prodag*	lb.	.28	.42
Purity Flake* (dlvd.)	lb.	.18	.19¼
Rubber-Flo*	gal.	1.25	2.00
Rubber-Glo*	gal.	—	.94
Rusco Mold Paste*	lb.	—	.25
Sericite* (l.c.l.)	ton	65.00	75.00
Silicone Oil A145*	lb.	3.18	3.61
Silrex (dms.)	lb.	—	.65
A65*	lb.	2.50	2.75
Soybean Lecithin	lb.	.13	.17
Thermalube*	lb.	—	.13¼
UC Silicone L-45*	lb.	3.14	4.75
L-522*	lb.	3.05	4.05
LE-45*	lb.	1.22	1.70
LE-450*	lb.	1.22	1.70
Ucon Lubricants*	lb.	.26¼	.27¾
Ulco Mold Soap*	lb.	.15	.29

LUBRICANTS, RUBBER

Diglycol Stearate Neutral (and SE) (dms.)	lb.	—	.25
Extrud-o-Lube*	gal.	1.33	1.54
G.B. Naphthenic Neutrals*	gal.	.11	.18
Ivory Chips*	lb.	.18¼	.19¼
Latex-Lube GR* (dlvd.)	lb.	.19¼	.20
No. 82-A* (450 lb. dms.)	lb.	—	.08½
Propylene Stearate (dms.)	lb.	.35	.60

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.41	.46
Calcium Stearate	lb.	.39	.44
Crown Brand*	lb.	.37	.42
D.C. 7 Compound*	lb.	5.13	6.50
D.C. 200 Fluid*	lb.	3.14	4.75
ELA*	lb.	—	.82
G-E Silicone Fluid SF-92*	lb.	3.14	4.25
Glycerized Lubricant*	gal.	1.25	1.48
Glydag B*	lb.	1.50	2.10
G*	lb.	1.30	2.45
Glyso-Lube* (dms.)	lb.	—	.14
No. 3* (dms.)	lb.	—	.14
HSC No. 35*	lb.	1.28	1.34
No. 515*	lb.	1.28	1.34
Hydro-Zinc*	lb.	—	.20
Latex-Lube Pigmented* (dlvd.)	lb.	.17¼	.18¼
R-66*	lb.	—	.16½
Liqui-Lube* (dlvd.)	lb.	—	.16¼
N.F.* (dlvd.)	lb.	—	.16¾
N.T.* (dlvd.)	lb.	—	.16¼
Lubrex*	lb.	.25	.30
Lubri-Cote	gal.	.86	1.00
Magnesium Stearate Crown Brand*	lb.	.40	.45
Polyethylene Glycol	lb.	.22	.26
Rubber Free (Concentrate)*	gal.	—	1.44
Jel*	lb.	.18	.21½
Slab-Dip* (dms.)	lb.	—	.15
Soybean Lecithin	lb.	.13	.17
Stock-Lube*	lb.	—	.19
UC Silicone L-45*	lb.	3.14	4.75
L-522*	lb.	3.05	4.05
LE-450*	lb.	1.22	1.70
Zinc Stearate	lb.	.41	.46

MOLD CLEANERS

Actusol* (dlvd.)	gal.	1.45	1.65
Alkon* (dlvd.)	lb.	.16	.16½
CA-301*	gal.	—	2.49
CA-302*	gal.	—	2.63
G-O 6910*	lb.	.38	.40
Metso Anhydrous*	cwt.	5.70	7.95
Metso 99*	cwt.	5.00	7.25
200*	cwt.	6.70	8.95
Granular*	cwt.	4.45	6.70
Orvus Extra Granules*	lb.	.22½	.23½
Rubber-Sol*	gal.	2.97	3.97
Sprex A.C.* (dlvd.)	lb.	.17¼	.18¼
Zip Mold Cleaner*	gal.	.95	1.45

PEPTIZING AGENTS

Peptizer P-12*	lb.	.95	1.25
Pepton 22 Plasticizer*	lb.	.81	.84
65*	lb.	1.20	1.23
65B*	lb.	.81	.84
RPA 2*	lb.	—	.82
3*	lb.	—	.48
3 Conc.*	lb.	—	.85
5*	lb.	—	.68
6*	lb.	—	1.62

PLASTICIZERS & SOFTENERS

Acto 500*	lb.	—	.09
Adipol BCA*	lb.	.45	.45½
2EH*	lb.	.42½	.43½
10A*	lb.	.42½	.43½
ODY*	lb.	.47½	.48½
810*	lb.	.42½	.45½
XX*	lb.	.42½	.43½
Anhydrol 6990*	lb.	.51	.56
Arneel SD*	lb.	.34	.40
Arolene 1980* (c.l.)	lb.	—	.10
Aromatic Plasticizer 10* (and 25*) (dms.)	lb.	.05	.06½
Aromatic Tar	gal.	.0573	.1973
Bardol*	lb.	.02¼	.03¾
B*	lb.	.06¼	.06½
Bayol D*	gal.	—	.382
F*	gal.	—	.52
Beeswax, Bleached	lb.	.76	.79
Yellow Refined	lb.	.68	.70
Bondogen*	lb.	.55½	.60½
B.R.C. No. 20*	lb.	.0150	.0175
No. 21*	lb.	.02¼	.03
No. 22*	lb.	.02½	.02¾
B.R.H. 2*	lb.	.0213	.0351
BRS 700*	lb.	.0200	.0285
B.k.T. 3*	lb.	.0180	.0265
4*	lb.	.0250	.0260
7*	lb.	.0300	.0310
B.R.V.*	lb.	.0475	.0565
Bunarex Resins*	lb.	.07	.08
Bunatak AH*	lb.	—	.09½
N*	lb.	—	.31
U*	lb.	—	.17½
No. 90*	lb.	—	.09
No. 210*	lb.	—	.14
Butac*	lb.	.12½	.13½
Butyl Carbitol Perlargonate (dms.)	lb.	—	.64½
Butyl Cellosolve Perlargonate (dms.)	lb.	—	.68
Butyl Oleate	lb.	.25½	.26½
Butyl Palmitate	lb.	—	.26½
Butyl Stearate (dms.)	lb.	.24½	.25½
BWH-1*	lb.	.16	.17
Cabflex DDA*	lb.	.40	.43½
DDP*	lb.	.29½	.33
Di-BA*	lb.	.41	.44½
Di-OA*	lb.	.40	.43½
Di-OP*	lb.	.28½	.32
Di-OZ*	lb.	.45½	.49
DOA*	lb.	.40	.43½
DOP*	lb.	.28½	.32
HS-10	lb.	.44	.47½
ODA*	lb.	.40	.43½
ODP*	lb.	.29	.32½
TCP*	lb.	.34½	.38
Califlux 510* (and 550*)	lb.	.02½	.03¼
G.P.*	lb.	.01¼	.02
R-100*	lb.	.04½	.05¼
TT*	lb.	.0170	.0245
Candelilla Wax, Prime	lb.	.70	.74
Refined Light	lb.	.73	.78
Carbowax 4000* (dms.)	lb.	.31	.32
Carnauba Wax, Crude	lb.	.71	.77
Flaked	lb.	.72	1.55
Refined, Technical	lb.	.72	.80
Refined, Pure	lb.	.80	.86
Yellow	lb.	1.42	1.45
Celluflex* (dms.) 112* (t.c., dlvd.)	lb.	—	.34½
179-A* (t.c., dlvd.)	lb.	—	.32½
179-C* (t.c., dlvd.)	lb.	—	.32½
179-EG* (t.c., dlvd.)	lb.	—	.32½
DBP* (t.c., dlvd.)	lb.	—	.30
DOP* (t.c., dlvd.)	lb.	—	.28½
TPP* (dms., eqld.)	lb.	—	.40
Ceresin Wax	lb.	.12	.30
Chlorowax 40*	lb.	.15¼	.17¼
50*	lb.	.16¾	.17¾
70*	lb.	.18½	.20
LV*	lb.	.17¼	.19¼
CTLA Polymer*	gal.	.20	.36
Cumar Resins*	lb.	.07	.19
Darex DBP*	lb.	.30	.33
DOP*	lb.	.30½	.33½
DIOP*	lb.	.30½	.33½
D.B.M.*	lb.	.32	.34¾
Decylbutyl Phthalate	lb.	.27	.29½
Degras, Common	lb.	—	.14
Diallyl Phthalate	lb.	.51½	.52½
Dibenzyl Sebacate	lb.	.88	.89½
Dibutoxyethyl Sebacate	lb.	—	.56¾
Dibutyl Phthalate	lb.	.30	.33½
Dibutyl Sebacate	lb.	.64½	.66
Dicapryl Adipate	lb.	.42	.44
Dicapryl Phthalate	lb.	.29½	.31
Dicapryl Sebacate	lb.	.58	.59½
Di-Carbitol Phthalate (dms.)	lb.	.47	.47½
Dicyclohexyl Phthalate	lb.	.58¼	.59¼
Diethyl Phthalate (t.c.)	lb.	.25	.27¾
Di-2-ethylhexyl Phthalate	lb.	—	.30½
Dihexyl Adipate	lb.	.40	.42½
Dihexyl Phthalate	lb.	.30	.32½

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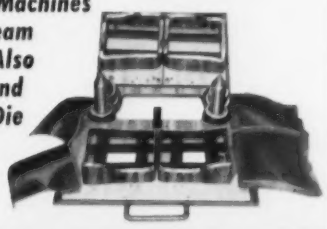

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Dihexyl Sebacate	lb.	.65	.74
Diisobutyl Azelate	lb.	——	.47¾
Di-iso-octyl Adipate	lb.	.40	.42½
Di-iso-octyl Phthalate (t.c.)	lb.	.28	.37½
Dimethyl Phthalate (t.c.)	lb.	.27½ -	.30¼
Dimethyl Sebacate	lb.	1.30	1.39
Dinonyl Adipate	lb.	.44½ -	.47½
Dinopol 235*	lb.	.38	.39
DDO*	lb.	.31	.32
MOP*	lb.	.35	.36
Dioctyl Adipate	lb.	.40	.42½
Dioctyl Phthalate (dms.)	lb.	.30½	.31½
Dioctyl Sebacate (dms.)	lb.	.58½	.60
D.I.O.P. (dms.)	lb.	.31	.32
Dipolymer Oil	gal.	.33 -	.48
Dispersing Oil No. 10*	lb.	.06 -	.06¼
Dutrex 6*	gal.	—— -	.11
15E*	gal.	—— -	.10
Elastex 10-P*	lb.	.30½ -	.33½
50-H*	lb.	.25 -	.28
DCHP*	lb.	.59 -	.60
Emulphor EL-719*	lb.	—— -	.58
Epoxy Plasticizer	lb.	.33¼ -	.36
Drapex 3.2*	lb.	.39¼ -	.44
Drapex 4.4*	lb.	.37 -	.42
Esparto Wax	lb.	—— -	.55
Estac*	lb.	—— -	.16
Facile Gum 4A*	lb.	.48 -	.50
Flexol B-400*	lb.	.27½ -	.28½
DOP*	lb.	.33 -	.34
TOP*	lb.	.45½ -	.46½
3GH*	lb.	.46 -	.46¾
3GO*	lb.	.55 -	.55¾
4GO*	lb.	.35 -	.36
426*	lb.	.29½ -	.30½
Flexricin P-1*	lb.	—— -	.32
P-4*	lb.	—— -	.34¼
P-6*	lb.	—— -	.41½
P-8*	lb.	—— -	.34¼
Fortex A* (dms.)	lb.	.12½ -	.14½
Galex W-100*	lb.	.15½ -	.19¼
G.B. Asphaltic Flux*	gal.	.10 -	.18
G.B. Light Process Oil*	lb.	.02½ -	.03¼
Medium Process Oil*	lb.	.03½ -	.04¼
G.B. Naphthenic Neutrale*	gal.	.11 -	.18
Good-rite GP233*	lb.	.40 -	.43½
GP235*	lb.	.40 -	.43½
GP236*	lb.	.40 -	.43½
GP261*	lb.	.28 -	.31½
GP265*	lb.	.28½ -	.32
GP266*	lb.	.29 -	.32½
GP-266-BPA*	lb.	.29 -	.32½
Hartlex 500* (dms.)	lb.	.31½ -	.34
HB20*	lb.	.15 -	.17
HB40*	lb.	.19 -	.22
Herron-H.T.*	gal.	.16 -	.27
Herron-Plas*	lb.	—— -	.03¾
Herron-Wax*	lb.	.05¼ -	.06
No. 23*	lb.	.08¼ -	.08¾
No. 24*	lb.	.07¼ -	.07¾
HSC No. 13*	lb.	.25 -	.32
No. 28 and 38*	lb.	.20 -	.27
Indonex 632½* (633½*, 634½*, 637½*)	gal.	.12 -	.19
Isooctyl Decyl Phthalate	lb.	.28½ -	.38
Kapsol*	lb.	.35 -	.35½
Kenflex*	lb.	.18 -	.27
Kesscoflex 101* (dms.)	lb.	—— -	.37½
103* (dms.)	lb.	—— -	.38
MCO* (dms.)	lb.	—— -	.35½
BCL* (dms.)	lb.	—— -	.37½
MCP* (dms.)	lb.	—— -	.41
BCP* (dms.)	lb.	—— -	.36
KP 23*	lb.	.31½ -	.32½
90*	lb.	.42½ -	.43½
140*	lb.	.48 -	.48½
201*	lb.	.58 -	.59
220*	lb.	.34½ -	.35½
555*	lb.	.56½ -	.57
Kremol 40*	gal.	.36 -	.46
50*	gal.	.39 -	.49
Kromisol* (dms.)	lb.	.33 -	.36
Kromtex AA* (dms.)	lb.	.35 -	.36
I* (dms.)	lb.	.35 -	.36
K-3*	lb.	.35 -	.36
MX*	lb.	.35 -	.36
Lanolin, Tech. Anhydrous	lb.	—— -	.26
Latex-Lube G.R.*	lb.	.19¼ -	.20
Lead Oleate	lb.	—— -	.29¾
Lindol* (dms., t.c.)	lb.	—— -	.32½
Locusol No. 1-6980*	lb.	.30 -	.34
2-Mercaptoethanol (dms.)	lb.	1.25 -	1.50
Methox*	lb.	.40½ -	.41
Methyl Laurate	lb.	.25 -	.27
Methyl Oleate	lb.	—— -	.20
Methyl Stearate (dms.)	lb.	—— -	.30
Monoplex DOS*	lb.	.59½ -	.60½
DBS*	lb.	.65½ -	.66½
S-70*	lb.	.41 -	.42
S-71*	lb.	.46½ -	.47½
Montan Wax, Crude	lb.	.26 -	.35
Flaked	lb.	.29 -	.40
Morflex*	lb.	.32 -	.69½
MR 2088* (dms.)	lb.	—— -	.19
Natac*	lb.	.12 -	.13
Nebony Resins* (dms.)	lb.	.04½ -	.05
Neolene 210* (t.c.)	lb.	—— -	.16
212* (t.c.)	lb.	—— -	.14
220* (t.c.)	lb.	—— -	.15
Nerium*	lb.	—— -	.09
Nevillac Resins* (dms.)	lb.	.31 -	.85
Neville LX-880* (dms.)	lb.	.12 -	.14½
LX-685* (dms.)	lb.	.12½ -	.17½
Neville Resins* (dms.)	lb.	.07¼ -	.20
Nevindene Resins* (dms.)	lb.	.16½ -	.20
Nevinol* (dms.)	lb.	—— -	.24

PLASTICIZERS & SOFTENERS (Cont'd)

Nuba 1* (and 2*) (dms.)	lb.	.06¼ -	.06¾
No. 480 Oil Proof Resin*	lb.	—— -	.18
Ohopex Q10* (dms.)	lb.	.32 -	.33
R9* (dms.)	lb.	.37¼ -	.37¾
Ortho-Nitrobiphenyl	lb.	.13 -	.15
Ozokerite Wax, White and Yellow	lb.	.24 -	.31
Paradene Resins (dms.)	lb.	.07¼ -	.08
No. 2 Flaked	lb.	.08 -	.08½
Para Flux* (dms.)	gal.	.19¼ -	.20¼
2016* (dms.)	gal.	.22 -	.23
Para Lube* (t.c.l.)	lb.	.046 -	.048
Paraplex G-25*	lb.	.76 -	.77
G-40*	lb.	.50 -	.51
G-50*	lb.	.40¾ -	.41¾
G-53*	lb.	.45 -	.46
G-60* (and G-61*)	lb.	.35 -	.36
G-62*	lb.	.37 -	.38
Parmo*	lb.	.06 -	.13½
Pepton 22 Plasticizer*	lb.	.81 -	.84
PG-16*	lb.	—— -	.35
Philrich-5* (t.c.)	gal.	—— -	.11
Picco 10* (and 25*)	lb.	.15 -	.17
60* (and 75*)	lb.	.15 -	.17
100*	lb.	.15 -	.17
Piccocizer 30*	lb.	.05½ -	.07
Piccolastic A* (B*, C*, D* & E*)	lb.	.28 -	.29
FT* (FHF* & FX*)	lb.	.1815 -	.1965
T-135*	lb.	.22¾ -	.23¼
Piccolyte S Resins*	lb.	.20½ -	.22¾
Piccopale Resins*	lb.	.12 -	.13
Piccoumaron Resins*	lb.	.07 -	.24½
Pigmentar*	lb.	.0460 -	.0745
Pigmentaroil*	lb.	.0460 -	.0745
Plastac M*	lb.	—— -	.09¼
Plasticizer 2286*	lb.	—— -	.26¼
Plasticizer 4141*	lb.	.56¾ -	.66¾
Plasticizer DP-200, DP-250, DP-520*	lb.	.42¼ -	.46¼
Plasticizer LP*	lb.	—— -	.07
Plasticizer MP*	lb.	—— -	.08
Plasticizer MT-511*	lb.	—— -	.68¾
Plasticizer ODN*	lb.	.35 -	.41
Plasticizer SC*	lb.	.42½ -	.43½
Plasticizer W-13*	lb.	.37 -	.38¾
Plastoflex 3*	lb.	—— -	.52
52*	lb.	.37¾ -	.38¾
VS*	lb.	.41¾ -	.42¾
Plastogen*	lb.	.08¼ -	.09
Plastolein 9050* (c.l.)	lb.	.54½ -	.56½
9055*	lb.	.30½ -	.32½
9058*	lb.	.48 -	.50
9250*	lb.	.38¼ -	.40¼
9715*	lb.	.39 -	.40
Plastone	lb.	.23 -	.27
Polycizer 162*	lb.	.28 -	.31½
332*	lb.	.40 -	.42½
562*	lb.	.28½ -	.32
662*	lb.	.29 -	.32½
532 and 632*	lb.	.40 -	.42½
ED*	lb.	—— -	.51
Polyco 438*	lb.	.34 -	.35
Polymel C-130*	lb.	.13¾ -	.14¾
D*	lb.	.22½ -	.23½
6*	lb.	.05¼ -	.07¾
Process Oil C-255* (c.l.)	gal.	—— -	.22
Propylene Stearate (dms.)	lb.	—— -	.32
PRR 1*	gal.	.15 -	.35
PT 67 Light Pine Oil* (dms.)	gal.	—— -	.60
101 Pine Tar Oil* (t.c., dms.)	gal.	.0460 -	.0634
400 Pine Tar* (600* & 800*) (t.c., dms.)	lb.	.0460 -	.0634
PX-104*	lb.	.30 -	.32½
PX-108*	lb.	.30½ -	.33
PX-138*	lb.	.32½ -	.33½
PX-208*	lb.	.44½ -	.45½
PX-238*	lb.	.44½ -	.45½
PX-404*	lb.	.66 -	.67
PX-438*	lb.	.60 -	.61
PX-800*	lb.	.34 -	.35
PX-917*	lb.	.36½ -	.37½
Reogen*	lb.	.14¼ -	.14½
465 Resin* (dms.)	lb.	.07½ -	.08
Resin C*	lb.	.0225 -	.0310
Resinex*	lb.	.03¼ -	.04¾
L-4*	lb.	.02¼ -	.03¼
Rexflex*	lb.	—— -	.15
Rosin Oil	gal.	.80 -	1.35
RR-10 (Neoprene)*	lb.	—— -	.37
R.S.O. Softening Oil*	lb.	.03 -	.05
RuBars*	lb.	.19¼ -	.20
Rubberol*	lb.	.18 -	.25¾
Santicizer B-16*	lb.	.48¼ -	.49¼
E-15*	lb.	.52¼ -	.53¾
M-17*	lb.	.44¼ -	.45¾
No. 140*	lb.	.32½ -	.36
No. 141*	lb.	.36 -	.37
No. 160*	lb.	.28½ -	.29½
No. 602*	lb.	—— -	.30½
No. 603*	lb.	—— -	.27
Sherolatum*	lb.	.03½ -	.06
Staflex DBES*	lb.	.58 -	.60½
DOS*	lb.	.58 -	.60½
IXA*	lb.	.32 -	.35
KA*	lb.	.36 -	.38¾
Stan Chlor Oils*	lb.	.13½ -	.20½
70*	lb.	.17½ -	.30
Stanolind Petrolatum*	lb.	.07 -	.156
Wax*	lb.	.31 -	.33
Sunny South Burgundy Pitch*	lb.	.1030 -	.1085
Pine Tar*	lb.	.0460 -	.0801
Pine Tar Oil*	lb.	.0460 -	.0745
Rosin Oil*	gal.	.58 -	.87½

PLASTICIZERS & SOFTENERS (Cont'd)

Superla Wax*	lb.	.30 -	.397
Syncera Wax*	lb.	.16 -	.267
Syn Tac* (c.l.)	gal.	—— -	.33
Synthetic Revertant Oil	lb.	—— -	.16
Tar, Refined	gal.	.1200 -	.1760
Tarpine	lb.	.035 -	.050
Terpene A*	gal.	—— -	.65
TP-90B*	lb.	.59 -	.69
TP-95*	lb.	.65 -	.74
Transphalt Resins*	lb.	.03¾ -	.05¼
Tributyl Phosphate	lb.	.52½ -	.53½
Tricresyl Phosphate	lb.	.32½ -	.36
Turgum S*	lb.	.10¾ -	.11¾
Vanadiset B*	lb.	.036 -	.07
C*	lb.	.031 -	.06
MR 80 Mesh*	lb.	.08½ -	.12½
Vistac No. 1*	gal.	1.00 -	1.21
P*	lb.	.18 -	.18½
Vopcolene 50*	lb.	—— -	.31
Witcizer 100*	lb.	.20¼ -	.21¼
200*	lb.	.20¼ -	.21¼
201*	lb.	.22¾ -	.25¼
300*	lb.	.30 -	.33½
312*	lb.	.30½ -	.34
313*	lb.	.30½ -	.34
412*	lb.	.42½ -	.46
Witresin*	ton	—— -	52.50

PROCESSING AIDS

Castor Oil, Blown (dms.)	lb.	—— -	.21
Refined (dms.)	lb.	—— -	.18½
Castorwax*	lb.	—— -	.24½
Dutrex 7*	lb.	.12 -	.20
ELA*	lb.	—— -	.82
Hydrofol Glycerides 200*	lb.	.15½ -	.19¾
Kenflex N*	lb.	—— -	.18
Maleic Anhydride	lb.	—— -	.27
Millrex*	lb.	—— -	.15
Nadic Anhydride	lb.	—— -	.75
Polycin*	lb.	—— -	.24½
Resin No. 510*	lb.	.19 -	.26
No. 529*	lb.	.25 -	.32
Pulverized*	lb.	.20½ -	.25
Thiomalic Acid	lb.	—— -	3.50
Zyrox*	lb.	.78 -	.88

PROTECTIVE & STABILIZING AGENTS

Acacia*	lb.	.12¼ -	.21
Alpha Protein	lb.	—— -	.23
Aroostoocrat*	lb.	—— -	.07½
Carob Bean Flour	lb.	—— -	.50
Casein	lb.	.32 -	.38
Emcol K-8300* (dms.)	lb.	.14 -	.18
Ethylene Diamine 68%	lb.	.44 -	.47
Gum Arabic	lb.	—— -	.23
Karaya Gum	lb.	—— -	.35
Locust Bean Gum	lb.	—— -	.50
Prosein*	lb.	—— -	.06
Stablex B*	lb.	.50 -	.95
K*	lb.	.27 -	.35

RECLAIMING AGENTS

Amalgamator Z-4*	lb.	.32 -	.33
Armeen C*	lb.	.46 -	.52
Mixed Crude*	lb.	.19 -	.25
T*	lb.	.32 -	.38
Burco RA*	lb.	.05 -	.081
C-6 Oil* (28* & 34*)	gal.	.33 -	.38
C-10 Oil*	gal.	.25 -	.30
C-33* (t.c.)	gal.	—— -	.21½
C-42* (t.c.)	gal.	—— -	.23
Caustic Soda—Flake 76% (c.l., dms.)	cwt.	—— -	4.50
Liquid 50% (t.c.)	cwt.	—— -	2.80
Solid 76% (c.l., dms.)	cwt.	—— -	4.10
Cresylic Acid (99-100%)	gal.	.85 -	1.39
D-4* (t.c.)	gal.	—— -	.27
E-5* (t.c.)	gal.	—— -	.25
Flake Calcium Chloride (77-80%)	ton	—— -	29.00
G.B. Reclaiming Oil*	gal.	.12 -	.18
CD-10*	gal.	.10 -	.16
CD-50-U*	gal.	.18 -	.24
Gensol No. 6* (t.c.)	gal.	—— -	.40
Heavy Aromatic Naphtha	gal.	.13¼ -	.18½
LX-77 Reclaiming Solvent*	gal.	.21 -	.33
LX-572 Reclaiming Oil*	gal.	.27 -	.32
LX-777 Reclaiming Oil*	gal.	.23 -	.33
Neo-Fat D-242*	lb.	.05½ -	.07¾
42-70*	lb.	.08¼ -	.10¼
No. 517 H.B. Oil*	gal.	.11½ -	.16½
535*	gal.	.22 -	.27
PT 67 Light Pine Oil* (dms.)	gal.	—— -	.60
PT 101 Pine Tar Oil* (t.c., dms.)	gal.	.0460 -	.0634
PT 150 Pine Solvents* (dms.)	gal.	—— -	.44
Q Oil* (t.c.)	gal.	—— -	.286
Reclaiming Oil 3186-G*	gal.	.25 -	.36½
Reclaiming Reagent No. 1431*	lb.	.21 -	.25
R.P.A. No. 3*	lb.	—— -	.47
RR-10*	lb.	—— -	.37
Soda Ash (c.l., bags)	cwt.	—— -	1.75
Solvent 534*	gal.	.20½ -	.26½
Solvent Oil 21*	gal.	.24 -	.29
C-42*	gal.	.23 -	.38
X-1 Resinous Oil*	lb.	.0225 -	.0325

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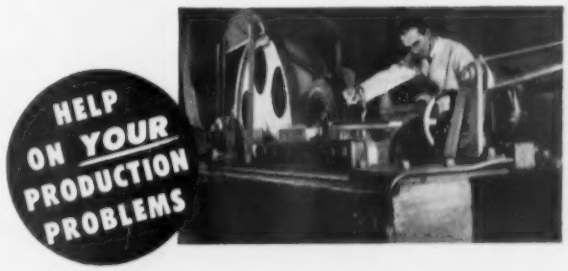

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Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98*	lb.	.0775	.1450
Continental F*	lb.	.0775	.1450
Croflex*	lb.	.0775	.1450
Dixiedensed (and S)*	lb.	.0775	.1450
Kosmobile (and S)*	lb.	.0775	.1450
Micronex HPC*	lb.	.0775	.1450
Witco No. 6*	lb.	.0775	.1450

Channel, Medium Processing (MPC) (bags)

Arrow MPC*	lb.	.0775	.1350
Atlantic MPC-95*	lb.	.0775	.1450
Continental A*	lb.	.0775	.1450
Croflex TH*	lb.	.0775	.1450
Dixiedensed HR (and S-66)	lb.	.0775	.1450
Kosmobile HM (and S-66)	lb.	.0775	.1450
Micronex Standard*	lb.	.0775	.1450
Spheron 6*	lb.	.0775	.1450
Texas M*	lb.	.0775	.1450
Witco No. 1*	lb.	.0775	.1450

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42*	lb.	.0775	.1450
Collocarb*	lb.	.0590	.1400
Continental AA*	lb.	.0775	.1450
Croflex 77*	lb.	.0775	.1450
Dixiedensed 77*	lb.	.0775	.1450
Kosmobile 77*	lb.	.0775	.1450
Micronex W-6*	lb.	.0775	.1450
Spheron 9*	lb.	.0775	.1450
Texas E*	lb.	.0775	.1450
Witco No. 12*	lb.	.0775	.1450
Wyex EPC*	lb.	.0775	.1350

Channel, Conductive (CC) (bags)

Continental R-40*	lb.	.2600	.3400
Dixie 5 Dustless*	lb.	.1350	.2100
Dixie Voltex*	lb.	.2600	.3400
Kosmink Dustless*	lb.	.1350	.2100
Kosmos Voltex*	lb.	.2600	.3400
Spheron C*	lb.	.1800	.2400
Voltex*	lb.	.2600	.3400

Channel, Surface Treated (STC) (bags)

Texas 109*	lb.	.0840	.1475

Conductive Furnace Black (CF) (bags)

Aromex CF*	lb.	.0875	.1450
Atlantic CF*	lb.	.0875	.1450
Continex CF*	lb.	.1050	.1550
Croflex CF*	lb.	.0875	.1450
Dixie CF*	lb.	.0875	.1450
Kosmos CF*	lb.	.0875	.1450
Shawinigan Acetylene Black*	lb.	——	.1900
Vulcan C*	lb.	.1100	.1750

Extra-Conductive Furnace Black (ECF) (bags)

Vulcan XC-72	lb.	.1775	.2700

Furnace, Fast Extruding (FEF) (bags)

Arovel FEF*	lb.	.0675	.1250
Continex FEF*	lb.	.0675	.1250
Croflex 50*	lb.	.0675	.1250
Dixie 50*	lb.	.0675	.1250
Kosmos 50*	lb.	.0675	.1250
Philblack A*	lb.	.0675	.1200
Statex M*	lb.	.0675	.1250
Sterling SO*	lb.	.0675	.1250

Furnace, Fine (FF) (bags)

Statex B*	lb.	.0725	.1300
Sterling 99*	lb.	.0725	.1300

Furnace, General Purpose (GPF) (bags)

Arogen GPF*	lb.	.0600	.1175
Dixie 35*	lb.	.0600	.1175
Kosmos 35*	lb.	.0600	.1175
Sterling V*	lb.	.0600	.1175
V (Non-Staining)	lb.	.0600	.1175

Furnace, High Abrasion (HAF) (bags)

Aromex HAF*	lb.	.0775	.1350
Continex HAF*	lb.	.0775	.1350
Croflex 60*	lb.	.0775	.1350
Dixie 60*	lb.	.0775	.1350
Kosmos 60*	lb.	.0775	.1350
Philblack O*	lb.	.0775	.1300
Statex R*	lb.	.0775	.1350
Vulcan 3*	lb.	.0775	.1350

Furnace, High Modulus (HMF) (bags)

Continex HMF*	lb.	.0675	.1200
Croflex 40*	lb.	.0675	.1250
Dixie 40*	lb.	.0675	.1250
Kosmos 40*	lb.	.0675	.1250
Modulex HMF*	lb.	.0675	.1200
Statex 93*	lb.	.0675	.1200
930*	lb.	.0675	.1200
Sterling L*	lb.	.0675	.1200
LL*	lb.	.0675	.1200

REINFORCING AGENTS—CARBON BLACK (Cont'd)

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF*	lb.	.0575	.1150
Croflex 20*	lb.	.0575	.1150
Dixie 20*	lb.	.0575	.1150
Essex SRF*	lb.	.0575	.1150
Furnex*	lb.	.0575	.1150
Gastex*	lb.	.0525	.1200
Kosmos 20*	lb.	.0575	.1150
Pelletex*	lb.	.0525	.1100
NS*	lb.	.0525	.1100
Shawinigan Acetylene Black*	lb.	——	.1900
Sterling NS*	lb.	.0575	.1150
R*	lb.	.0625	.1250
S*	lb.	.0575	.1150

Furnace Super Abrasion (SAF) (bags)

Dixie 85	lb.	.1150	.1650
Kosmos 85	lb.	.1150	.1650
Philblack E*	lb.	.1150	.1550
Vulcan 9*	lb.	.1150	.1800

Furnace, Super Abrasion, Intermediate (ISAF) (bags)

Aromex ISAF*	lb.	.0925	.1500
Continex ISAF*	lb.	.0925	.1500
Dixie 70*	lb.	.0925	.1500
Kosmos 70*	lb.	.0925	.1500
Philblack I*	lb.	.0925	.1450
Statex 125*	lb.	.0925	.1500
Vulcan 6*	lb.	.0925	.1500

Furnace, Super Conductive (SCF) (bags)

Vulcan SC*	lb.	.1800	.2450

Thermal, Fine (FT) (bags)

P-33 (c.l.)*	lb.	——	.0575
Sterling FT (c.l.)*	lb.	——	.0575

Thermal, Medium (MT) (bags)

Shellblack*(†)	lb.	——	.0250
Sterling MT (c.l.)*	lb.	——	.0400
MT Non-Staining (c.l.)*	lb.	——	.0500
Thermax (c.l.)*	lb.	——	.0400
Stainless (c.l.)	lb.	——	.0500

REINFORCING AGENTS—SILICA

Cab-O-Sil (compressed)*	lb.	.68	.75
Cab-O-Sil (uncompressed)*	lb.	.68	.75
D. C. Silica (pelletized)*	lb.	1.45	1.65
Hi-Sil 101*	lb.	.14	.15½
233*	lb.	.09	.10½
X303*	lb.	.40	.45
Santocel*	lb.	.62	.64
Valron Estersil*	lb.	2.00	2.25

REINFORCING AGENTS—MISCELLANEOUS

Angelo Shellac*	lb.	.50	.60
Darex Copolymer No. 3*	lb.	.47	.49
43G*	lb.	.39	.41
Darex Copolymer Latex No. 3-L	lb.	.41½	.46
Durez 12687 (and 12707)*	lb.	——	.38½
Durez 13355*	lb.	——	.30
Good-rite Resin 50*	lb.	.39	.41
Hystron*	lb.	.39	.41
Kralac A-EP*	lb.	.39	.41
Lampblack	lb.	——	.12
Marbon S and S-1*	lb.	.39	.41
8000*	lb.	.39	.41
Marmix*	lb.	.39	.41
Pliolite Latex 150*	lb.	.35	.39
Pliolite Resin-Rubber Masterbatches*	lb.	.33	.57
Pliolite NR*	lb.	.93	.95
S6B*	lb.	.39	.41
Plio-Tuf G85C*	lb.	.52	.54
Polyco 220*	lb.	.18¼	.19¼
Polypol S-70*	lb.	.22	.23

RETARDERS

Benzoic Acid TBAO-2*	lb.	——	.44
Dutch Boy Normasal*	lb.	——	.46
ESEN*	lb.	.35	.37
Good-rite Vultrol*	lb.	.62	.64
Harcopol 1183*	lb.	.70	.74
Retarder J*	lb.	.62	.64
PD*	lb.	.37	.39
W*	lb.	——	.42
Retardex*	lb.	.47	.50

RUBBER SUBSTITUTES

Mineral Rubber

Byerlyte*	ton	50.00	57.00
Hard Hydrocarbon (dms.)*	ton	53.00	55.00
Herron Flake*	ton	——	45.00
Mineral Rubber, Solid	ton	42.50	44.50
M. R. No. 38*	ton	55.00	65.00
Witresin	ton	——	52.50

Vulcanized Vegetable Oils

Amberex*	lb.	.29	.36
Brown	lb.	.15	.24
Car-Bel-Lite*	lb.	.3000	.3300
Neophax*	lb.	.17	.27
Polyrez A and C*	lb.	.12	.17
White	lb.	.15	.26

Miscellaneous Rubber Substitutes

G.B. Asphaltenes*	lb.	.06	.06½
Gilsowax B*	lb.	.09	.11
Resin No. 1098 (dms.)	lb.	——	.62
No. 1198*	lb.	.46¼	.49¾
Tysonite*	lb.	.26	.26¼

SOLVENTS

Acetone (dlvd.)	lb.	.10½	.11½
Amsco Lactol Spirits* (t.c.)	gal.	——	.19
Naphthol Spirits*	gal.	——	.18
Mineral Spirits*	gal.	——	.17
Rubber Solvent* (t.c.)	gal.	——	.18
Solv A* (t.c.)	gal.	——	.24½
Solv A-80* (t.c.)	gal.	——	.30
Solv B* (t.c.)	gal.	——	.28½
Solv B-90* (t.c.)	gal.	——	.32
Solv D* (t.c.)	gal.	——	.30
Solv E*	gal.	——	.30
Solv F*	gal.	——	.30
Solv F-80*	gal.	——	.32½
Solv G*	gal.	——	.42½
Special Naphtholite* (t.c.)	gal.	——	.18
Special Textile Spirits*	gal.	——	.19
Super Hi-Flash Naphtha*	gal.	——	.35
Super Naphtholite*	gal.	——	.18
Textile Spirits* (t.c.)	gal.	——	.19
Amyl Chlorides, Mixed (t.c.l.) (dms.)	lb.	——	.11
Benzol 90%	gal.	.36	.40
Butyl Acetate (t.c.)	lb.	——	.13½
Butyl Alcohol (t.c.)	lb.	——	.13½
Secondary (dlvd.)	lb.	.14½	.15½
Tertiary (dlvd.)	lb.	.14½	.15½
Carbon Bisulfide, Tech.	lb.	.05½	.07½
Carbon Tetrachloride	lb.	.10	.13½
Cosol 1*	gal.	.37	.43
2*	gal.	.42	.48
Cyclohexane	gal.	.55	.72
85% (c.l.) (dms.)	gal.	——	.56
Cyclohexanone	lb.	.29	.31½
Diacetone, Pure (dlvd.)	lb.	.15	.16
Dichlorethyl Ether (dms.)	lb.	.14½	.15
Formal (dms.)	lb.	.30¼	.31¼
Dichloropentanes (t.c.l.) (dms.)	lb.	——	.06
Dicom*	gal.	——	.50
Halowax Oil*	lb.	.28	.41
Heptanes* (t.c.)	gal.	.19	.22
Hexanes (t.c.)	gal.	.19	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.57	.64
Ether, Ref. (dlvd.)	lb.	.09½	.10½
Mersol*	gal.	.43	.79
Mesityl Oxide (dlvd.)	lb.	.14½	.15½
Methyl Acetone, Syn. (dms., dlvd.)	gal.	.57	.63
Methyl Chloride	lb.	——	.11½
Methyl Ethyl Ketone	lb.	.14½	.15½
Methyl Isobutyl Ketone (dlvd.)	lb.	.16½	.17½
Methylene Chloride	lb.	.11¾	.16
N-5 Pentane Mix* (t.c.)	gal.	——	.13½
N-6 Hexanes* (t.c.)	gal.	——	.14½
N-7 Hexanes* (t.c.)	gal.	——	.13½
Penetrell*	gal.	.40	.62
Perchlorethylene	lb.	.11½	.14½
Petrolene* (t.c.)	gal.	——	.14125
Picolines, Alpha, Refined	lb.	.43½	.44
Mixed	lb.	.32½	.33
Proprietary Solvent (dms.)	gal.	.66	.77
Propyl Acetate (t.c., dlvd.)	lb.	——	.11¾
Alcohol (t.c., dlvd.)	lb.	——	.11
PT 150 Pine Solvent* (dms.)	gal.	——	.44
Pyridine, Refined	lb.	.74½	.75
Quinoline	lb.	.50	.54¼
Rubber Solvent (t.c.)	gal.	——	.16
Rubsol (t.c.)	gal.	——	.12875
Skellysolve B (Hexanes)* (t.c.)	gal.	——	.158
C (Heptanes)* (t.c.)	gal.	——	.151
R (Rubber Solvent)*	gal.	——	1.29
Solvent, Crude, Light	gal.	.19	.28
Solvesso 100* (t.c.)	gal.	.33	.35
150 (t.c.)	gal.	.33	——
Sunny South DD Dipentine*	gal.	.40	.62
Sunny South DD Pine Oil*	lb.	.12¼	.14¼

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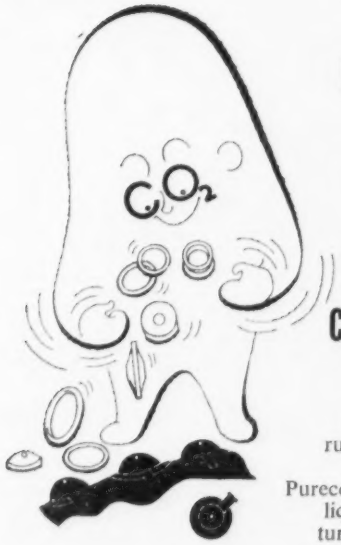

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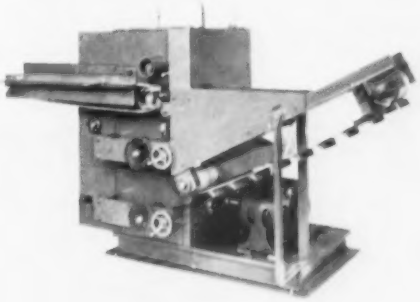

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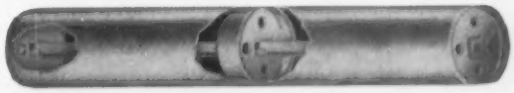

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Also Special Trucks (Leaf Type) Racks, Tables and Jigs, Used in manufacturing rubber and plastic products.

THE W. F. GAMMETER COMPANY
CADIZ, OHIO

SOLVENTS (Cont'd)

Sunray*	gal.	.1140	.1600
Toluene (dms.)	gal.	——	.38
Toluol (t.c.)	gal.	.33	.35
Trichlorethane	lb.	.13	.13½
Triglycol Dichloride	lb.	.63	.64
Union Thinner 1* (t.c.)	gal.	——	.174
5* (dms.)	gal.	——	.199
7* (t.c.)	gal.	——	.164
2-50 W Hi-Flash*	gal.	——	.41
Xylol	gal.	.34	.38

STABILIZING AGENTS (for Vinyl Resins)

Advastab BC-12*	lb.	.90	.95
BC-74*	lb.	.70	.75
BC-105*	lb.	.75	.80
CH-101*	lb.	.60	.65
CH-201*	lb.	.60	.65
E-82*	lb.	.90	.95
JCX*	lb.	.62	.67
L Paste*	lb.	.65	.70
SN*	lb.	.47	.52
T-10*	lb.	1.90	1.95
T-50-LT*	lb.	3.20	3.25
XBZ-155*	lb.	.69	.74
XC-143*	lb.	.90	.95
XE-98*	lb.	.53	.58
Barca 10*	lb.	.75	.80
Barium Ricinoleate (BVS)	lb.	——	.70
Barium Stearate	lb.	.39	.44
Basic Silicate White Lead	lb.	.20¾	.21¼
Cadmium Ricinoleate	lb.	——	2.00
Calcium Ricinoleate	lb.	——	.55
Dutch Boy DS-207*	lb.	——	.54
Plumb-O-Sil A*	lb.	——	.29¾
B*	lb.	——	.31⅛
Tribase*	lb.	——	.26½
Dythal*	lb.	——	.39½
Ferro 182* (dms.)	lb.	.70	.76
200* (dms.)	lb.	1.33	1.43
203* (dms.)	lb.	.85	.95
541* (dms.)	lb.	.35½	.45½
541A* (dms.)	lb.	.81¼	.91¼
700* (dms.)	lb.	.48¾	.58¾
900* (dms.)	lb.	.90	1.00
903* (dms.)	lb.	.55	.65
909* (dms.)	lb.	.91	1.01
920*	lb.	——	.98
931* (dms.)	lb.	.75¼	.85¼
993* (dms.)	lb.	.89	.99
1203* (dms.)	lb.	1.30	1.40
1206* (dms.)	lb.	1.23	1.33
1820* (dms.)	lb.	.90	1.00
1825* (dms.)	lb.	1.00	1.10
Permyl A	lb.	.45	.55
Harshaw 1-V-3*	lb.	.43	.45
1-V-4*	lb.	.66½	.70
1-V-7*	lb.	.66	.68
2-V-4*	lb.	.85	.87
2-V-7*	lb.	——	1.10
2-V-8*	lb.	——	1.30
5-V-1*	lb.	.41	.43
7-V-1*	lb.	——	.90
8-V-1*	lb.	.88	.90
8-V-5*	lb.	——	.80
8-V-100*	lb.	.82	.84
9-V-1*	lb.	.70	.72
12-V-5*	lb.	.73	.75
24-V-1*	lb.	1.10	1.12
28-V-2*	lb.	——	1.18
128-V-5*	lb.	.86	.88
Lithium Stearate	lb.	.52	.57
Fluffy	lb.	.47½	.70
Standard	lb.	.52½	.75
Mark C*	lb.	.88	.90
E*	lb.	.72	.75
M*	lb.	.68	.70
PL*	lb.	.63	.65
TT*	lb.	.72	.75
WS*	lb.	.98	1.00
X*	lb.	2.50	2.75
XI*	lb.	.87	.90
XV*	lb.	.88	.90
XX*	lb.	.58	.60
Metasap 613-A*	lb.	——	.69
613-B*	lb.	——	.84
613-C*	lb.	——	1.06
621*	lb.	——	.88
624*	lb.	——	.75
633*	lb.	——	.75
635*	lb.	——	.45
Modicol N*	lb.	.41½	.42½
S*	lb.	.30⅜	.31⅜
Sodium Silicates 41°/1:32	cwt.	1.00	2.10
Stabelan E*	lb.	1.35	1.50
XL*	lb.	.55	.65
HR-50*	lb.	.75	.90
HR Liquid*	lb.	.65	.75
HR Paste*	lb.	.85	.95
HR Powder*	lb.	.95	1.05
No. 110 Liquid	lb.	.65	.75
No. 115 Liquid	lb.	.85	.95
No. 120 Liquid	lb.	.65	.75
Stabilizer No. 52*	lb.	1.90	2.00
89X*	lb.	.75	.80
B-5*	lb.	——	.70
E6B*	lb.	——	.95
G-1*	lb.	1.25	1.40
HR*	lb.	.85	.89
L*	lb.	——	.60
OM-10*	lb.	——	1.95
Staflex OY*	lb.	1.00	1.20
QXMA*	lb.	——	.70

STABILIZING AGENTS (Cont'd)

Stayrite 10*	lb.	.34	.36
P-10*	lb.	.41	.43
15*	lb.	.53	.58
20*	lb.	.37	.42
22*	lb.	1.00	1.13
25*	lb.	.35	.40
70*	lb.	.68	.70
71*	lb.	.88	.90
75*	lb.	.59	.62
76*	lb.	.53	.55
80*	lb.	.68	.70
90*	lb.	.68	.70
95*	lb.	.68	.70
229*	lb.	.45	.50
Vanstay C-73*	lb.	.63	.65
HT*	lb.	.90	.92
L*	lb.	.33	.35
N*	lb.	.98	1.00
R*	lb.	.70	.72
S*	lb.	.63	.65
Z*	lb.	.67	.69

STIFFENING AGENTS

Polyac*	lb.	——	1.80
Processing Stiffener 710*	lb.	——	.88
Solvitose HDF, H, C-S, T, and E*	lb.	.22	.25
Versatil Gum 8-E*	lb.	.15	.19

SUN CHECKING AGENTS

Allied AA-1144*	lb.	.23	.24
AA-1177*	lb.	.15½	.16½
Antisol*	lb.	——	.23
Antisun* (Chipped)	lb.	.15½	.17½
(Slabbed)	lb.	.15	.17
Heliozone*	lb.	.31	.32
Microflake*	lb.	.20	.24
Nacconol NRSF*	lb.	.40½	.45
NBC*	lb.	——	1.55
Ross Sunproofing Waxes*	lb.	——	.14½
Sunolite*	lb.	.16	.22
127*	lb.	.16½	.20½
154*	lb.	.23	.25
Sunproof*	lb.	.31	.32
713*	lb.	.25	.26
Improved*	lb.	.25	.26
Super*	lb.	.40	.41
Jr.*	lb.	.20	.21
Tonox*	lb.	.52	.54

SURFACE ACTIVE AGENTS

Anhydrapent*	lb.	.56	.59
Anhydrol 6990*	lb.	.51	.56
6991*	lb.	.51	.56
Aquarex D*	lb.	——	.78
G*	lb.	——	.21
MDL*	lb.	——	.33
ME*	lb.	——	.80
NS*	lb.	——	.60
SMO*	lb.	——	.50
WAQ*	lb.	——	.22
Emulphor EL-620*	lb.	——	.40
EL-719*	lb.	——	.58
ON-870*	lb.	——	.55
Igepal CA-630	lb.	——	.29
CO-630	lb.	——	.29
CO-730	lb.	——	.29
CO-850*	lb.	——	.29
CO-880*	lb.	——	.29
Igepon CN-42*	lb.	——	.25
T-33*	lb.	——	.21
T-51*	lb.	——	.13½
T-77*	lb.	——	.49
Kessco 50201*	lb.	——	.43½
50203*	lb.	——	.46
18201*	lb.	——	.36½
18203*	lb.	——	.36
Pluronic L62*	lb.	.33½	.39
L64*	lb.	.33½	.39
Sellogen Gel*	lb.	——	.12¾
Soybean Lecithin	lb.	.13	.17

TACKIFIERS

Amalgamator Z-4*	lb.	.32	.33
Arcco 620-32B*	lb.	.20½	.21½
716-30*	lb.	.18½	.19½
1041-21*	lb.	.16½	.17½
A-26*	lb.	.18	.19
Bunaweld Polymer No. 780*	lb.	——	.24
No. 5514*	lb.	——	.35
Galex* (dms.)	lb.	.17¾	.18¾
Indopol H-300*	gal.	1.00	1.22
Koresin*	lb.	——	.95
Liquid Rubber Flux*	lb.	——	.14
Nacconal NRSF* (dlvd.)	lb.	.40½	.45
Nilox Resin* (c.l.)	cwt.	——	14.50
Resin V	lb.	——	.23½
Synthol*	lb.	.17	.24¼
Vistac A*	lb.	.21½	.22¼
Vistanex LM Grades*	lb.	——	.45
Zirex* (c.l.)	cwt.	——	14.75

THICKENERS (For Latex)

Alcogum AN-6*	lb.	——	.05
AN-10*	lb.	——	.08½
PA-10*	lb.	——	.12
Betanol* (dms.)	lb.	.70	.95
Gomme Labolene*	lb.	.45	.47
Good-rite K-702*	lb.	.34½	.35
K-704*	lb.	.21	.22
K-705*	lb.	.31	.32
K-707*	lb.	.18	.19
K-708*	lb.	.29	.30
K-710*	lb.	.15	.16

THICKENERS (For Latex) (Cont'd)

Modicol VD*	lb.	.13¾	.14¼
VE*	lb.	.13⅜	.14⅛
Polyco 296 BT*	lb.	.15	.16
296-N*	lb.	.15	.16
530*	lb.	.15	.16
Propylene Laurate (dms.)	lb.	.57	.82
Sodium Silicate, 41°/1:3.2	cwt.	1.10	2.20
Solvitose Series*	lb.	.22	.25

VULCANIZING AGENTS

Selenium

Vandex*	lb.	——	15.50

Sulfur

Aero Brand* (c.l.)	cwt.	——	2.65
Blackbird* (c.l.)	cwt.	——	2.85
Cloud* (c.l.)	cwt.	——	2.80
Crystex*	lb.	.19½	.23
Darex Dispersed Sulfur*	lb.	.14	.16
Devil A* (c.l.)	cwt.	——	2.40
Dispersed Sulfur	lb.	.14	.16
Insoluble Sulfur 60*	lb.	.12½	.13
Ko-Blend IS*	lb.	——	.39
Mist* (Wettable) (c.l.)	cwt.	——	4.00
Spider* (c.l.)	cwt.	——	2.80
Star* (c.l.)	cwt.	——	3.25
Sulfasan R*	lb.	——	1.50
Tire* (c.l.)	cwt.	——	2.40
Tube* (c.l.)	cwt.	——	3.25
Vultac 2*	lb.	.47	.49
3*	lb.	.51	.53

Tellurium

Telloy*	lb.	——	2.50

WETTING AGENTS

Advawet No. 10*	lb.	——	.17
No. 33*	lb.	——	.48
Aerosol 18*	lb.	——	.40
AY*	lb.	1.00	1.20
MA 80%*	lb.	.67	.72
OS*	lb.	.39	.45
OT 75% Aqueous*	lb.	.63	.68
OT 100%*	lb.	1.00	1.20
OT-B*	lb.	.85	1.05
Alrosal* (dms.)	lb.	——	.40
Alrosperse*	lb.	——	.18
Anhydrol 6990* and 6991*	lb.	.51	.56
Areskap 50*	lb.	.30	.32
Dry 100*	lb.	.60	.64
Aresket Dry 300*	lb.	.60	.64
Aresklene 375*	lb.	.42	.47
Armacs*	lb.	.28	.77
Arquads*	lb.	.42	.61
Emcol 5100* (dms.)	lb.	——	.31
Energetic W-100	lb.	.28½	.35
Etho-Chemicals*	lb.	.26	.58
Ethomeen S/15*	lb.	.48	.50
T/15*	lb.	.46	.48
Kesco E-122* (dms.)	lb.	——	.45
18201*	lb.	——	.38½
Kreelon 4D* (dms.)	lb.	.13	.16
8G* (dms.)	lb.	.26	.28
Kyro EO* (dms.)	lb.	——	.29¼
Modicol N*	lb.	.41½	.42½
S*	lb.	.30⅜	.31⅜
Nacconol SL* (dlvd.)	lb.	.084	.10
60S* (dlvd.)	lb.	.19	.225
Nacconol A* (dlvd.)	lb.	——	.52
Nekal WS-25	lb.	——	.38
WS-99	lb.	——	.95
Orvus AB Granules*	lb.	.15¾	.16¾
Parnol*	lb.	.13	.18
Regal Beads	lb.	.12¾	.16¾
H. D. Beads	lb.	.12¾	.15¾
Santomerse No. 3	lb.	.41	.45
S*	lb.	1.55	1.85
Selapon Gel*	lb.	——	.13
Sorapon SF-73*	lb.	——	.18
SF-78*	lb.	——	.30
Sorbit P*	lb.	——	.28
Soybean Lecithin	lb.	.13	.17
Stablex G*	lb.	.50	.90
Tergitol 4* (dms., dlvd.)	lb.	.32	.33
7* (dms., dlvd.)	lb.	.43	.44
O8* (dms., dlvd.)	lb.	.31	.32
P28* (dms., dlvd.)	lb.	.18½	.19
Trenamine W-30	lb.	——	.15
Vultamol*	lb.	——	.17½
Wetsit Conc.*	lb.	.25	.28

MISCELLANEOUS CHEMICALS

Aquesperse 30*	lb.	——	.11
Arccopel W-18*	lb.	.17	.19
Asbury Graphite*	lb.	.05	1.45
Copper Inhibitor X-872-L*	lb.	——	2.01
D-Tac*	lb.	——	.22
2-Ethyl Hexanol	lb.	.23¼	.24¼
Fura-Tone Resin 1226*	lb.	.41	.43
MODX*	lb.	.32½	.34½
Nacconates* (dms.)	lb.	.99	3.53
Para Resins*	lb.	.04	.04½
Pigmented Filmite* (dlvd.)	lb.	.16¾	——
Resorcin, Tech.	lb.	.77½	.81½
Rio Resin*	lb.	.65	.67
Rongalite CX*	lb.	——	.21½
Sherosopes*	lb.	.13½	.18¾
Sublac Resin PX-5*	lb.	.23½	.24½
Synpep*	lb.	.54	.60
Thiokol LP-2*	lb.	——	.96
LP-3, LP-32, LP-33*	lb.	——	.96
LP-8*	lb.	1.25	1.35
Tysonite*	lb.	.26	.26¾
VA-7*	lb.	——	.50
Vanfre*	gal.	2.50	3.00

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CHEMIST, experienced, practical-technical. Specializing in production of foam rubber and latex compounding. Also in setting up new foam rubber factories, familiar with all of the latest equipment. Excellent knowledge in manufacturing of camelback and all other molded products. 1A references. Address Box 820-P, RUBBER AGE.

MECHANICAL ENGINEER, with 15 years experience managing Sales, Manufacturing and Development functions of molded rubber plant, desires new connection. Background includes extensive national market acquaintance; engineering custom and catalog products and supporting molds, dies and equipment; processing by transfer or compression; fabrication of metal components. Address Box 827-P, RUBBER AGE.

LATEX FOAM Production Executive, 10 years experience of all aspects technical control, compounding, and production; thorough knowledge of operation of continuous and batch processing, quality control, costing, planning, etc. accustomed to handling mixed labor, seeks new executive position with vigorous progressive company. Address Box 828-P, RUBBER AGE.

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WANTED: Chemist compounder with broad experience in aeronautical, automotive, and appliance specifications. Experienced in rubber to metal. Excellent opportunity with old established molded goods manufacturer. Address Box No. 821-W, RUBBER AGE.

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Medium-sized Philadelphia area plant needs a man as assistant to the chief chemist. Must have a degree and a minimum of two years factory experience in compounding. Excellent potential—salary commensurate with ability. Send resumé. Address Box 824-W, RUBBER AGE.

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opening Canadian plant
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of this new operation.
Products are sold
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Canadian citizen required.
Should have experience
and following
in above industries.
Excellent opportunity
for advancement.
All replies
will be confidential.

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moderate sized rubber plant
specializing in mechanical parts molding
Middle West location preferred.

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INDEX

Volume 80 — October 1956-March, 1957

Page Arrangements for Volume 80

No.	Date	From Page	To Page
1	October, 1956	1	182
2	November, 1956	183	388
3	December, 1956	389	586
4	January, 1957	587	752
5	February, 1957	753	930
6	March, 1957	931	1110

A

Akron University Offers Advanced Compounding Course 857
Amberg, L. O.
Pine Products 674
American Chemical Society
Gehman Receives Editorial Post 1048
Polyester Rubber Described at Polymer-Chemistry Division Meeting (Sept. 17) 301
Polymer Division Officers Named 704
Rassweiler Elected President 692
American Institute of Electrical Engineers
Holds Symposium on Polyethylene (Jan. 22) 861
American Society of Mechanical Engineers
Rubber and Plastics Division Holds One-Day New York Meeting (Nov. 29) 512
American Society for Testing Materials
Committee D-11 Holds Spring Meeting in Philadelphia (Feb. 6-8) 1044
Forms Cellular Plastics Group 1051
Forms Radiation Subcommittee 310
Standards Supplements Published 708
Authors
Amberg, L. O. 674
Bevilacqua, E. M. 271
Blake, John T. 1021
Boonstra, B. B. 284
Deasy, J. J. 1001
Dillon, John H. 1022
Doner, Sherman P. 1024
Drogin, Isaac 457
Duke, June 83
Fiorenza, A. 69
Grover, Frank S. 843
Johnson, E. H. 285
Keen, W. Newlin 1025
Kitchen, Leland J. 843
Kurtz, Stewart S., Jr. 673
Lavery, Thomas F. 843
Liska, John W. 1023
McDowell, M. V. 500
Muller, J. A. 279
Nabors, Lester G. 837, 1027
Northam, A. J. 77
Phreaner, Ellis H. 255
Pollack, Maxwell A. 676
Powers, P. O. 676
Prem, Dorothy 83
Sands, A. G. 500
Scott, David C., Jr. 1020
Smith, Sydney 843
Sobierajski, C. A. 282
Sprague, George R. 281
Studebaker, Merton L. 661, 837, 1027
Wetherbee, Burt 834
White, B. B. 1001
White, William L. 278
Wolf, Ralph F. 823, 1007
Automatic Vulcanizer for Retreading Eliminates Air Bags 270

B

Belting
Cone Drive Handles 18,000 Pounds of Belting 277
How to Arrange Rider Belt Drives 1006
Latest Developments in Rubber Belting ..... *William L. White* 278
Non-Stretchable Seamless Rubber Belt (Armstrong Cork) 671
U. S. Rubber Expanding Belt Plant 865
Bevilacqua, E. M.
Reaction of Molecular Oxygen with Rubber 271
Book Reviews
Ageing and Weathering of Rubber (I.R.I.) 360
Alco Oil and Chemical Products (Alco Oil & Chemical) 901
An Adventure in Profits (Mobay Chemical) 363
Annual Report on the Progress of Rubber Technology: 1955 (W. Heffer & Sons) ... 899
ASTM Standards on Textile Materials (ASTM) 145
Barrett Standard Industrial Chemicals: 1956 (Allied Chemical & Dye) 362
Belt Idler Specifications (Joy Mfg.) ... 147
Biological Treatment of Sewage and Industrial Wastes Vol. I—Aerobic Oxidation (Reinhold) 556
Calenders for Rubber Processing (I.R.I.) 360
Catalin Antioxidant AC-1 (Catalin) 729
Chemistry of Acrylamide (American Cyanamid) 146
The Chemistry and Technology of Waxes (Reinhold) 144
Chlorowax LV—A Secondary Plasticizer for Vinyl Resins (Diamond Alkali) 362
Commercial Waxes (Chemical Publishing) 899
Condensed Chemical Dictionary (Reinhold Publishing) 361
CRV Cradle-Mounted Type Pumps (Ingersoll-Rand) 728
Cyclo-Trell Multiple Tube Dust Collector (Research-Cottrell) 147
Dayton Poly-Koolfoam (Dayton Rubber) .. 363
Dielectric Ovens (Young Bros.) 1086
Directory of New England Manufacturers: 1957 (George D. Hall) 726
Dresinal Resin Dispersions (Hercules Powder) 729
Empol 1022 Polymerized Fatty Acid (Emery Industries) 558
Engineering Inspection Manual (Chemical Publishing) 899
Engineering Uses of Rubber (Reinhold) .. 898
Evaluation of Carbon Black Dispersion in Polyethylene Masterbatches (Godfrey L. Cabot) 901
Evaluation of Insulating Oils European Developments (ASTM) 557
Farrel-Birmingham 6x13-inch Laboratory Mills for Rubber and Plastics (Farrel-Birmingham) 363
Fawick Standardized Press Application (Fawick) 1086
Fluid Agitation Handbook (Chemineer) ... 557
Fundamental Mechanisms in Polyethylene Extrusion (Bakelite) 1087
Glossary of Terms Relating to Rubber and Rubberlike Materials (ASTM) 726
How to Choose an Extruder (Proctor) ... 147
Hystron (General Tire) 558
Improvement of the Low Temperature Behavior of Natural Rubber Vulcanizates by Chemical Modification with Thiol Acids (Rubber-Stichting) 144
Improving Human Relations (National Association of Manufacturers) 900
Industrial Ovens and Dryers: Safe Installation and Operation (Associated Factory Mutual Fire Insurance Companies) 1087
Industrial Vision (Chilton) 361
Injection Molding of Cycloc (Marbon Chemical) 728
Irrathene Irradiated Polyethylene Insulating Tape (G-E) 559
Kel-F Fluorocarbon Products (M. W. Kellogg) 363
Kesscoflex Plasticizers (Kessler Chemical) 728
Kirk and Blum Ovens for Industry (Kirk & Blum) 146
Krene Cast Vinyl Film (Bakelite) 900
Lange's Handbook of Chemistry (Handbook Publishers) 726
Latex: Natural and Synthetic (Reinhold Publishing) 145
Link-Belt Company Directory (Link-Belt) 729
Maglite D in Hypalon (Marine Magnesium) 558
Maglite D in Neoprene (Merck) 362
Management in Action (AMA) 145
Management Guide to Vacuum Forming (Vacuum Forming) 147
Manual of Reclaimed Rubber (Rubber Reclaimers Assn.) 556
Manufacturers Wire Handbook (Pittsburgh Steel) 901
Marblette Digest of Plastic Tooling (Marblette) 558
Metasap Vinyl Stabilizers (Metasap Chemical) 362
Methoden der Organischen Chemie "Houben-Weyl" (Methods of Organic Chemistry) (Georg Thieme) 1084
Modern Plastics Encyclopedia—1956 (Modern Plastics) 361
Mooney Shearing Disc Viscometer: Model STI (Scott Testers) 901
New Standard in Automatic Molding (Hull-Standard) 147
Nitroparaffin Symposium (Commercial Solvents) 559
Oilgear Directional Control Valves (Oilgear) 146
Oilgear Fluid Power Constant Displacement Pumps (Oilgear) 147
Penacolite Brittle Resins (Koppers) 146
Physical Properties of Carbide and Carbon Chemicals (Carbide & Carbon Chemicals) 559
Plastisol Molding (Watson Standard) ... 727
Pratt & Whitney Rad-L-Acc Gages (Pratt & Whitney) 729
Quality Control for Plastics Engineers (Reinhold Publishing) 898
Quick Selection Tables for Variable Speed Texrope Drives (Allis-Chalmers) 146
Rubber Workers' History — 1935-1955 (URW) 1085
Scott Tester Model CET (Scott Testers) .. 728
Shell Synthetic Rubber (Shell Chemical) 559
Stokers (Johnston & Jennings) 1087
Story of Unitane Titanium Dioxide (American Cyanamid) 558
Swelling of Neoprene in Chemicals, Oils and Solvents (DuPont) 363
Symposium on Impact Testing (ASTM) .. 557
Symposium on Speed of Testing of Non-Metallic Materials (ASTM) 1085
Synthetic Organic Chemicals: U. S. Production and Sales: 1955 (U. S. Tariff Commission) 900
Taylor-Stiles Cutters (Taylor-Stiles) ... 362
Technical Seminar on Synthetic Latex Polymers (Goodyear) 901
Technology for the Analysis, Design and Use of Textile Structures as Engineering Materials (ASTM) 557
Tested by Time (Harshaw Chemical) 900
Textbook of Organic Chemistry (Georg Thieme) 727
Twenty-five Questions Most Frequently Asked About the Microlimit Control (Industrial Gauges) 728
Union Carbide W-96 — Silicone Rubber Gum Stock (Union Carbide & Carbon) 1087
Unitex Centrifuged Natural Hevea Latex (Stein, Hall) 1086
Vistanex (Enjay) 729
Boonstra, B. B.
Latest Developments in Reinforcing Pigments 284
Bocon Polymers, OTS Issues Report On 318
Butadiene
Dow Licenses Esso Research to Use Type B Catalyst and Process 1061
Super-Heated Steam Used as Diluent in Manufacture of 833

Butadiene-Styrene
ASRC Expanding Louisville Plant 319
Bureau of Ships Surveys GR-S Type Polymers 862
Compounding of Transparent Rubber. II—Styrene-Butadiene, Nitrile, Butyl and Neoprene Rubbers .....*Ralph F. Wolf* 1007
Dilute Solution Viscosity—Its Use and Interpretation with GR-S Polymers.....*June Duke and Dorothy Prem* 83
Disposal:
FPC Takes Over Disposal Commission Duties; Offers Louisville Alcohol-Butadiene Lease 89
Government Abandons Plans to Lease Louisville Plant 685
GSA Seeking Industry Bids for Laboratories at Akron 685
Louisville Plant Sale Eased in New Bill Before Congress 853
Two Bids Filed for Lease of Louisville Plant 505
Goodrich-Gulf to Convert One Line at Institute to Cold Rubber 1043
Butyl Rubber
All-Butyl Passenger Casing Developed by Esso Research 97
Compounding of Transparent Rubber. II—Styrene-Butadiene, Nitrile, Butyl and Neoprene Rubber .....*Ralph F. Wolf* 1007
Elastopar Butyl Rubber Modifier 328
Esso Research Opens Pilot Plant 313
French Plant Formed 326
Petroleum Chemicals to Build Plant 878

C

Canada
Dominion Rubber Opens New Foam Rubber Plant at Kitchener 534
Dunlop Rubber Signs Guaranteed Annual Wage Plan 880
Fire Damages National Rubber Co. 1064
Footwear Industry Files Brief with Tariff Board 710
Goodyear Earnings Hit Record High 1064
Goodyear Expanding Bowmanville Plant 332
Gutta-Percha and Rubber Planning New Plant 332
Polymer Plans $7,000,000 1957 Capital Expenditures 880
Seventh Canadian High Polymer Forum Held (Nov. 8-9) 524
Tariff Board to Investigate Canvas-Rubber Footwear Industry 534
Visking Becomes Union Carbide Division 880
Visking to Construct Polyethylene Film Plant 710
Carbon Black
Chemistry of Reinforcement. I—Some reactions Between Carbon Black and Simple Inorganic Molecules *Merton L. Studebaker* 661
II—Scorch in Natural Rubber Stocks Containing Carbon Black .....*Merton L. Studebaker and Lester B. Nabors* 837
III—Model Systems Containing Carbon Black and Squalene.....*Merton L. Studebaker and Lester G. Nabors* 1027
Effects of Mixing Time on Properties Imparted to Rubber by Reinforcing Carbon Blacks .....*Isaac Drogin* 457
Huber Plans Australian Black Plant 103
Identification of Carbon Blacks by Means of Spectrophotometric Measurements .....*A. Fiorenza* 69
Census Bureau Reports on Rubber Industry—Not Elsewhere Classified 308
Chemicals and Compounding Ingredients
Acrylic Thickener (Rohm & Haas) 116
Aquacal Calcium Stearate (Beacon Chemical Industries) 116
Benzidene Toner Yellow 2222 (Zinsser) .. 298
Bunco Isocyanate (Carwin) 112
Chemigum Latex 247 (Goodyear) 697
Chemlok One-Coat Adhesives (Lord Mfg.) 533
Crotonfast Green Toner 4D-3600 (Zinsser) 298
Crystex Improved Insoluble Sulfur (Stauffer) 878
Dipac Delayed Action Accelerator (Pennsalt) 96
DMHF Water Soluble Resin (Glyco Products) 882
Elastopar Butyl Rubber Modifier (Monsatto) 328
Endor Plasticizer (DuPont) 523
Green Y Toner 4D-3350 (Zinsser) 298
HMDA-Carbamate Controlled Curing Agent (M. W. Kellogg) 869
Hycar Carboxylic Elastomer (Goodrich Chemical) 122
Kenflex A Neoprene Plasticizer (Kenrich) 865
Monamine 7-70 Thickening Agent (Mona Industries) 870
Monitor A Water Softener (Globe Compound) 529
Nalco 71-K Antifoam Agent (National Aluminate) 109
Nalco Release Agents (National Aluminate) 328
Offering Glycidyl Methacrylate (DuPont) 876
Orzon P Lignin Sulfonate (Crown Zellerbach) 697
Papi Isocyanate (Carwin) 112
Chemicals (Cont'd)
Paraflint Synthetic Wax (Moore & Munger) 533
Plasticizer 3049-S (Emery Industries) ... 854
Pliobond H. T. Adhesive (Goodyear) 526
Polylite Antioxidant-Stabilizer (Naugatuck Chemical) 862
Polymeric Plasticizer (Eastman Chemical Products) 108
Protective Coating (Goodyear) 698
PX-313 Plasticizer (Pittsburgh Coke) 1060
Resiweld Bonding Agents (H. B. Fuller) 865
RP and VP Gravure Inks (Claremont Pigment Dispersion) 1064
Sintox Synthetic Mineral (Sintox) 112
Tenamene Antiozonants (Eastman Chemical Products) 526
Thixcin E Flow Control Agent (Baker Castor Oil) 1062
Vicotril-A Thickening Agent (Ferro Chemical) 112
Chemistry of Reinforcement. I—Some Reactions Between Carbon Black and Simple Inorganic Molecules *Merton L. Studebaker* 661
II—Scorch in Natural Rubber Stocks Containing Carbon Black *Merton L. Studebaker and Lester G. Nabors* 837
III—Model Systems Containing Carbon Black and Squalene *Merton L. Studebaker and Lester G. Nabors* 1027
Chemprufe Fluorothene Film and Sheet, Process for Forming 75
Coal Tar and Polymerized Products .....*P. O. Powers* 676
Colors in Elastomers, Matching of 77
Compounding of Transparent Rubber. I—Natural Rubber .....*Ralph F. Wolf* 823
II—Styrene-Butadiene, Nitrile, Butyl and Neoprene Rubbers .....*Ralph F. Wolf* 1007
Compounding Silicone Rubber for Minimum Shrinkage .....*J. J. Deasy and B. B. White* 1001
Cone Drive Handles 18,000 Pounds of Belting 277
Coral Rubber, Army Tests in Tires 103

D

Damping Bibliography Compiled by Air Force 315
Davis, C. C., Announces Retirement from Boston Woven Hose 301
Deasy, J. J., and White, B. B.,
Compounding Silicone Rubber for Minimum Shrinkage 1001
Dilute Solution Viscosity—Its Use and Interpretation with GR-S Polymers .....*June Duke and Dorothy Prem* 83
Drogin, Isaac
Effects of Mixing Time on Properties Imparted to Rubber by Reinforcing Carbon Blacks 457
Duke, June, and Prem, Dorothy
Dilute Solution Viscosity—Its Use and Interpretation with GR-S Polymers 83
Du Pont de Nemours & Co., Inc., E. I.
Adding to Elastomers Laboratory 300
Announces Formation of Elastomer Chemicals Department 297
Elastomers Laboratory Wins Award 557
Plans New Titanium Plant 1062
Resumes Sale of Valron Estersil 111

E

Editorials
Another Advance 87
Capitol Cues 1035
Chemistry Problems 1035
Delayed Deliveries 293
Growth Potential 503
Higher Yields 851
Major Impact 683
Realistic Approach 851
Unusual Situation 87
Effects of Mixing Time on Properties Imparted to Rubber by Reinforcing Carbon Blacks .....*Isaac Drogin* 457
Electrical Stabilization of Conducting Neoprene Films .....*A. G. Sands and M. V. McDowell* 500
England
British Hydrocarbon Chemicals Opens New Polyethylene Plant 317
Classification Index Available from RABRM 698
Forth Chemicals Completes Expansion of Styrene Monomer Plant 318
I.C.I. Opens New Laboratories 301
I.R.I. Conference Postponed 1037
Monsanto Chemicals Expanding 108
Neoprene Plant Planned in 522
New Styrene Plant Planned 96
NRDB Holds Interesting London Conference on Rubber in Engineering (Sept. 27) 298
Plans Synthetic Plant 296
U. S. Rubber Acquires North British Rubber Co. 310
Equipment for High-Temperature Testing *Thomas F. Lavery, Frank S. Grover, Sydney Smith and Leland J. Kitchen* 843
Ester Plasticizers .....*Maxwell A. Pollack* 676

F

Fiorenza, A.,
Identification of Carbon Blacks by Means of Spectrophotometric Measurements 69
Firestone Tire & Rubber Co.
Abandons Styrene Plant Plans 106
Developments:
Diatex Rubber Webbing 348
Town and Country Tire 302
Harvey Firestone Predicts 52% Consumption Rise by 1965 98
Increases 14-Inch Tire Output 330
Jackson Named Vice-Chairman 854
Nationwide Strike Ends 523
Plans New Air Spring Plant 324
Successful Tests Completed on Collapsible Tanks 109
Fluorothene Film and Sheet, Process for Forming Chemprufe 75

G

General Tire & Rubber Co.
Buys Byers Stock 106
Buys Lawrence Process Co. 326
Construction Program Under Way 311
Development:
Winter-Cleat 14-Inch Tire 326
1956 Sales Hit High of $390,471,772 1053
Goodrich, B. F., Co.
Army Ordnance Tests Ameripol SN Tires 308
Developments:
Convertapipe Hose 551
DeLuxe Silvertown Tire 302
Duolock Bonding System 324
Jet Aircraft Hose 717
Multi-Link Koroseal Matting 718
New Latex Process 114
Vibrasorb V-Belt 134
Details Education Program 1060
FTC Begins Hearings on Restraint-of-Trade by 96
Opens Philippine Plant 313
Profit for 1956 Drops 1052
Suit Against U. S. Rubber Dismissed by Federal Court 686
Vulcanizes Tire Through Nuclear Radiation 1038
Goods and Specialties
Baseballs and Softballs (Hofran) 134
Bath Toys (Oak Rubber) 128
Bulk Liquid Transport Unit (U. S. Army) 858
Campco Extruded Sheet (Chicago Molded Products) 298
Chem Rubber-Fix Kit (Patch Rubber) 842
C I D Inflated Portable Warehouse (U. S. Rubber) 546
Compound No. 1318 (Goshen Rubber) ... 302
Convertapipe Hose (Goodrich) 551
Custom Molded Gaskets (Minnesota Rubber) 1073
Diatex Rubber Webbing (Firestone) 348
Double-Face Adhesive Film (Angier Adhesives) 320
Duraseal Vinyl Waterstops (Electrovert) 876
Electriduct Extension Cord (Ideas) 128
Extra-Long Discharge Hose (Quaker Rubber) 888
Fairprene Tarpaulin Fabric (DuPont) ... 719
Fire Engine Booster Hose (Thermoid) .. 719
Flex-O Rubber Floor Pads (Bumpers) 889
Flying Fish Fins (Martin Rubber) 132
Goodrich Jet Aircraft Hose (Goodrich) ... 717
Handiflex Mop (Va. Plastics & Chemical) 130
Hi-Capacity V-Belt (Thermoid) 546
High-Impact Styrene Sheet (Chicago Molded Products) 350
Hi-Top Work Rubber (Tingley Rubber) .. 344
HR Series Fog Nozzles (Bete Fog Nozzle) 719
Ibsen Aqua-Belt (Plastimayd Products) .. 888
Kaokork Gasketing Material (F. D. Farnam) 890
Loxite Household Cement (Firestone) ... 111
Multi-Link Koroseal Matting (Goodrich) 718
Neoprene Flash Supports (Fisher Scientific) 547
Neoprene Heavy Duty Suits (Standard Oiled Clothing) 1072
Neoprene Pet-Dor (Johnson) 350
Neoprene Tarpaulins (Webb Mfg.) 130
Non-Flammable Contact Cement (Borden) 686
Non-Stretchable Seamless Rubber Belt (Armstrong Cork) 671
"Nyfil 120 R S" Belt Fabric (Goodrich) .. 344
One-Piece Pressure Seal (Precision Rubber) 716
Paruba Roofing Compound (Seaboard Plastics) 695
Pistol Grip Adapter (Pachmayr Gun Works) 1077
Plastic Heel Bases (Goodyear) 334
Plastic Trash Can (Loma Plastics) 346
Polyethylene Drum Plug (Delaware Barrel & Drum) 891
Porter Vinyl Electrical Tape (Quaker Rubber) 348
Premium 125 Tread Rubber (Seiberling) 533
Respiratory Masks (Flexo Products) 1077
Rigid Vinyl Relief Map (Airo Service).. 718
Rope-Like Hot Melt Adhesives (United Shoe Machinery) 547
Rubber-Backed Fur Rug Patented 858
Rubber-Bellows Air Spring (Goodyear).. 548
Rubber Car Rugs (Dayton Rubber) 346
Rubber Mats for Cows 300

GOODS AND SPECIALTIES (Cont'd)
Rubber Recoil Pad (Darnell) 889
Safe T Mate Beach Toys (Apex Tire) .. 1072
Save-A-Wallet Device (Scully Rubber) .. 551
Screw-On Conveyor Belt Cleats (T. H. Hinchcliffe) 716
Sculptured All-Vinyl Playballs (Sun Rubber) 350
Sealdbin Industrial Container (U. S. Rubber) 717
Sealtuft Quilted Vinyl (Jason) 132
Self-Sticking Foam Tape (Foamart) 348
Silastic Brain Valve (Dow Corning) 506
Single-Type Rim Valve (Goodyear) 134
Sponge Carpet Cushions (U. S. Rubber) 130
Steve Nagy Bowling Grip (Kee-Bair Products) 548
Translucent Hatch Tent (Herculite Protective Fabrics) 1074
Triple-Tone Vinyl Flooring (Goodyear) .. 346
Tri-Tex Vinyl Fabric (Middletown Rubber) 1074
Uscoweld Pipe Fittings (U. S. Rubber) .. 890
U. S. Royal Senior Golf Ball (U. S. Rubber) 859
Vibrasorb V-Belt (Goodrich) 134
Vinyl Backed Strapping Tape (Dutch Brand) 891
Vinylfoam Coin Pad (Wright Sales) 1073
Vinyl Toys (Sun Rubber) 1074
Water Base Adhesive (Bond Adhesives) .. 97
GOODYEAR TIRE AND RUBBER CO.
Dedicates Philippine Plant 319
Developments:
Arctic Aircraft Tires 695
Captive-Aire 14-Inch Tire 328
Chemigum Latex 247 697
Plastic Heel Bases 334
Pliobond H. T. Adhesive 526
Protective Coating 698
Rib Hi Miler Truck Tire 94
Rubber-Bellows Air Spring 548
Single-Type Rim Valve 134
Sprinkler Head 882
Suburbanite 175 Bicycle Tire 328
Trailer Tire-Rim-Wheel Unit 98
Triple-Tone Vinyl Flooring 346
Vinyl Gaskets 322
Earnings in 1956 Set All-Time Company High 1053
Education Program to Continue Through 1957 1060
Expands Niagara Falls Plant 527
Experimental Garage Opened 311
Forms New International Subsidiary 1049
Opens New Tire and Tube Plant in Venezuela 95
Opens Radiation Laboratory in Akron 515
Produces 700,000,000th Tire 334
Signs New Contract with URW 1049
To Build Tread Rubber Plant 96
GROVER, FRANK S., SMITH, SYDNEY, KITCHEN, LELAND J., and LAVERY, THOMAS F.
Equipment for High-Temperature Testing 843

H

Hermann Weber & Co. Celebrating 50th Year in Rubber Industry 861
HEWITT-ROBINS, INC.
Constructing Urethane Plant 97
Tile Manufacturing Equipment Sold to Johnson Rubber 1061
High Temperature Testing, Equipment For 843
Hose
Extra-Long Discharge Hose (Quaker Rubber) 888
Latest Development in Rubber Hose ..... *J. A. Muller* 279
Methods of Overcoming "Wicking" in Rubber Hose 277
How the Army's Tire Technicians Save Rubber and Money 81
How to Arrange Rider Belt Drive 1006
How Engineered Cooling Paid Off for the Western Backing & Coating Co. ..... *Burt Wetherbee* 834

I

Identification of Carbon Blacks by Means of Spectrophotometric Measurements ..... *A. Fiorenza* 69
Increasing the Accuracy of pH Measurements 86
INSTITUTION OF THE RUBBER INDUSTRY
Hears Polymer Corp. Lecture (Nov. 28) 698
Publications Committee Issues New Literature List 519
Wiegand Awarded Colwyn Medal 519
Israel, Talalay Assigns Foam Rubber Patent Rights to 109

J

JAPAN
New PVC Plant Opens 531
Synthetic Rubber Plant Being Considered 527
JOHNSON, E. A.
Latest Developments in Machinery and Equipment 285
Johnson Rubber Buys Tile Manufacturing Equipment from Hewitt-Robins 1061

K

Kaiser Aluminum Buys Wire and Cable Business of U. S. Rubber 864
KITCHEN, LELAND J., LAVERY, THOMAS F., GROVER, FRANK S., and SMITH, SYDNEY
Equipment for High-Temperature Testing 843
KURTZ, STEWART S., JR.
Petroleum Products 673

L

LABOR
Big Four Sign Supplemental Pay Facts.. 93
Firestone Strike Ends 523
Goodyear and URW Sign New Contract 1049
Labor-Management Talks Continuing at O'Sullivan Rubber 1049
Local 186 Plans Community Store 864
Non-Insured Pension Funds in Rubber Industry 853
Strike at Akron Plant of American Hard Rubber Ends 523
URW Criticizes U. S. Rubber Plant Closing 864
Latest Developments in Mechanical Rubber Goods (A Symposium Held by the New York Rubber Group) 278
Latest Developments in Rubber Belting ..... *William L. White* 278
Latest Developments in Rubber Hose ..... *J. A. Muller* 279
Latest Developments in Expanded Rubber ..... *George R. Sprague* 281
Latest Developments in Small Molded Goods ..... *C. A. Sobierajski* 282
Latest Developments in Reinforcing Pigments ..... *B. B. Boonstra* 284
Latest Developments in Machinery and Equipment ..... *E. H. Johnson* 285
Questions and Answers 246
LATEX
Chemigum Latex 247 (Goodyear) 697
Coating Emulsions Developed (Georgia Institute of Technology) 708
Goodrich Develops New Synthetic Latex Process 114
LAVERY, THOMAS F., GROVER, FRANK S., SMITH, SYDNEY, and KITCHEN, LELAND J.
Equipment for High-Temperature Testing 843
LEGAL
Albert-Harris in Patent Suit 876
Court Halts Thermoid Meeting 105
Davis Pays $40,000 Fine 308
FTC Rules Full Investigation on TBA Restraint-of-Trade Cases 507
Firestone Hearings Opened 864
Goodrich Hearings Opened 96
Goodrich Hearings Postponed 299
Hearings to Resume in May 1066
Goodrich Suit Against U. S. Rubber Dismissed by Federal Court 686
Nolo Contendere Plea Filed by Six Firms on V-Belt Sale Suit 1060
Quantity Discount Rule Thrown Out by Federal Court 1037
Rubber Firms Deny Price Fixing 89
U. S. Rubber Denies Patent Infringement 1048

M

MACHINERY AND EQUIPMENT
Air Drill Hose (Hewitt-Robins) 1043
Appearance-Retention Tester (Fabric Development Tests) 76
Automatic Thickness Gage (Tracerlab) ... 850
CB Measurite Proportioning Unit (New England Engineering) 136
Cleveland Top Entering Mixers (Cleveland Mixer) 720
Custom-Built Hydrolair Press (Elmes Engineering) 856
Directional Valve (Valvair) 1083
Dunlap Friction Meter (Nash & Thompson) 140
Elasticity Tester (Firestone) 75
Electric Tension Indicator (Tensitron) ... 897
Electronic Micro Indentation Tester (H. W. Wallace) 896
Elevating Loading Table (Loomis Engineering & Mfg.) 1082
Goliath Automatic Shoe Vulcanizer (Gidley Laboratories) 142
Heat Transfer Insert (F. R. Gross) 552
Hull-Standard Plastic Molding Presses (Hull-Standard) 724
Larger K-M Hydraulic Presses (Kingsbacher-Murphy) 722
Marking Hose and Wire Coder (Industrial Marking Equipment) 1018
Model LGH Scott Tester (Scott Testers).. 1078
Model TM Metal Detector (J. W. Dice).. 552
Mooney Viscometer (Scott Testers) 352
Non-Contact Gauging of Insulated Cable Diameters (Industrial Gauges) 895
Non-Indicating Controllers (Wheelco Instruments) 850
Nucor Non-Contact Thickness Gauges (Nuclear Corp. of America) 356
Ovens for Drying and Curing Foam Rubber (Young Brothers) 892
Plastic Master Cutting Units (Eastman Machine) 895
MACHINERY AND EQUIPMENT (Cont'd)
Plastifoamer Polyurethane Production Device (O-Cel-O) 122
Plastometer (Fischer & Porter) 1082
Polyurethane Foam Machine (Klauder Williams) 853
Portable High Frequency Heater (Obel-P-Products) 1080
Power Slug Cutter (G. F. Goodman) 354
R-36 Automatic Vulcanizer (Goodride Tire) 270
Rubber Cement Processor (Chemineer) 142
Rubber Sealing Test Jig (Precision Scientific) 76
Sardap TU-3A Gamma Gage (Nuclear Research) 142
Solenoid and Master Air Valves (Hanna Engineering Works) 554
Sparton Remote Proportioning Control System (Sparks-Withington) 720
Splitting Head for Foam Materials (Campbell Machinery Development) 358
Sprunance Clamps (Scott Testers) 76
Triplematic Dispensing Machine (H. V. Hardman) 1018
Twin Compression Molding Presses (Elmes Engineering) 853
Vacuum Forming Machines (Latymer Engineering) 554
Vapo Fuser for Coatings (F. C. Dawson) 356
Wohler Foam Compression Tester (Browning Instrument) 724
X-Ray Microscope (G. E.) 1080
Z-Calender (Farrel-Birmingham) 310
Matching of Colors in Elastomers ..... *A. J. Northam* 77
MCDOWELL, M. V., and SANDS, A. G.
Electrical Stabilization of Conducting Neoprene Films 500
Molded Vinyl Relief Globes Lend Themselves to Mass Production (Geo-Physical Maps, Inc.) 270
Molecular Oxygen, Reaction of, with Rubber 271
MULLER, J. A.
Latest Developments in Rubber Hose 279
Mylar Bonding Process Developed 1056

N

NABORS, LESTER G., and STUDEBAKER, MERTON L.
Chemistry of Reinforcement, II—Scorch in Natural Rubber Stocks Containing Carbon Black 837
III—Model Systems Containing Carbon Black and Squalene 1027
NBS adds Two Synthetic Rubbers to Standard Sample List 858
NATIONAL SCIENCE FOUNDATION
Reports on Rubber Research Activities... 295
Sets Program of Basic Research on High Polymers 700
NATURAL RUBBER
Chemistry of Reinforcement, II—Scorch in Natural Rubber Stocks Containing Carbon Blacks *Merton L. Studebaker and Lester G. Nabors* 837
Compounding of Transparent Rubber, I—Natural Rubber ..... *Ralph F. Wolf* 823
GSA Shelves Industry Stockpile Proposals 295
GSA Stockpiling Reorganized 109
Highly Purified Natural 2103A (U.S. Rubber) 314
Mexican Government Plans 3-Year Rubber Program 519
ODM Postpones Industry Stockpile Proposal 505
Peruvian Rubber Program Aided by U. S. Cooperation 511
Plans for Rubber Terminal in New York City Abandoned 853
RMA Issues New Type Descriptions 1041
USDA Successfully Synthesizes Natural Rubber 328
NEOPRENE RUBBER
Compounding of Transparent Rubber, II—Styrene-Butadiene, Nitrile, Butyl and Neoprene Rubbers ..... *Ralph F. Wolf* 1007
Electrical Stabilization of Conducting Neoprene Films ..... *A. G. Sands and M. V. McDowell* 500
New English Plant Planned 522
New Air-Drying Protective Finish for Steel Battery Trays 269
NITRILE RUBBER
Compounding of Transparent Rubber, II—Styrene-Butadiene, Nitrile, Butyl and Neoprene Rubbers ..... *Ralph F. Wolf* 1007
NORTHAM, A. J.
Matching of Colors in Elastomers 77

O

OBITUARIES
Anderson, William D. 882
Bachner, Marcel F. 1066
Baldwin, James C. 122
Becker, John J. 334
Bennett, Charles E. 122
Billes, John W. 536
Brazier, Sidney A. 712
Caldwell, Ernest B. 334
Cinefelter, James C. 712

OBITUARIES (Cont'd)
Connell, Harmon ... 712
Eagles, Reginald H. ... 536
Esty, Wesley H. ... 122
Fenstemaker, Fred E. ... 536
Fisher, Paul L. ... 712
Foote, Edwin A. ... 882
Forker, John N. ... 122
Gardner, Lester D. ... 536
Glass, H. Donald ... 536
Guinzburg, Ralph K. ... 882
Haddock, William C., Jr. ... 122
Himmelright, Robert J. ... 538
Hofmann, Fritz ... 538
Jacobs, V. R. ... 334
Kahn, Edith F. ... 712
Knight, Maurice A. ... 538
Landes, Gene B. ... 536
Lea, Robert W. ... 538
Lyon, George, Jr. ... 122
Maimin, Mayer ... 122
Mathes, Roger A. ... 882
Napier, Melvin J. ... 1066
Niceum, Elmo E. ... 536
Nye, H. E. ... 882
Parker, Urban H. ... 712
Pierce, MacNeel ... 334
Polson, Harry B. ... 122
Ridley, Henry Nicholas ... 334
Ross, William A. ... 712
Schulman, Irving ... 882
Shaw, R. O. ... 538
Shea, John F. ... 882
Shepherd, Leland H. ... 538
Snow, Larry D. ... 334
Wall, Philip M. ... 1066
Wilson, Edgar H. ... 712
Wingert, William B. ... 536
Yardley, Farnham ... 712
Ozone Deterioration Reports Issued by OTS 1051

P

Petroleum Products...*Stewart S. Kurtz, Jr.* 673
PHREANER, ELLIS H.
Properties of Silicone Modified Rubbers... 255
pH Measurements, Increasing the Accuracy of ... 86
Physical Testing in the Rubber and Plastics Industries (Symposium Held by the Akron Rubber Group) ... 1019
Equipment ... *David C. Scott, Jr.* 1020
Plastics and Insulated Wire *John F. Blake* 1021
Fabrics ... *John H. Dillon* 1022
Tire Compounds ... *John W. Liska* 1023
Mechanical Goods ... *Sherman R. Doner* 1024
Specialty Rubbers ... *W. Newlin Keen* 1025
Pine Products ... *L. O. Amberg* 674
Pirelli Memorial Established ... 519
POLLACK, MAXWELL A.
Ester Plasticizers ... 676
POLYETHYLENE
British Hydrocarbon Chemicals Opens New English Plant ... 317
G-E to Expand Irrathene Output ... 872
Grace Acquires Hyrad Process ... 297
National Petro-Chemicals to Produce Polyethylene ... 310
Polyethylene Surface Tape (General Tape) 116
Visking to Construct Film Plant in Canada 710
Vulkene Reinforced (G-E) ... 111
POLYURETHANE
Catwin Offers Two New Isocyanates ... 112
Genufoam Polyurethane Line (Texas Foamed Plastics) ... 94
Hewitt-Robins Constructing New Plant for Manufacture of Urethane Foam ... 97
Improved Urethane Formulation (Dayton Rubber) ... 695
Mobay Expanding Isocyanate Output ... 867
Mobay Gets New Patent ... 319
National Aniline Opens New Isocyanates Plant ... 533
New Polyurethane Foam System Announced by Chase Chemical ... 687
Plastifoomer Polyurethane Foam Production Device ... 122
Pluronic Polyethers (Wyandotte) ... 878
Polyol Production Underway by Celanese 318
POWERS, P. O.
Coal Tar and Polymerized Products ... 676
PREM, DOROTHY and DUKE, JUNE
Dilute Solution Viscosity—Its Use and Interpretation with GR-S Polymers ... 83
Process for Forming Chempruf Fluorothene Film and Sheet ... 78
Properties of Silicone Modified Rubbers ... *Ellis H. Phreaner* 255

Q

QMC Forms Fabric Rainwear Committee 1066

R

Reaction of Molecular Oxygen with Rubber ... *E. M. Bevilacqua* 271
Reclaimers Re-Elect Officers ... 862
RUBBER DIVISION, A.C.S.
Accepting Goodyear Medal Nominations... 882
Boggs and Rieman Win Best Paper Award 515
RUBBER DIVISION (Cont'd)
Co-Sponsors Rubber Literature Symposium (Sept. 18-19) ... 95
Dawson Wins Best Paper Award ... 107
Holds Meeting in Atlantic City (Sept. 19-21) ... 90
Manual for Rubber Libraries Published... 698
RUBBER GROUPS
Akron Holds Panel Discussion on Physical Testing (Jan. 25) ... 876
Akron Holds Symposium on Physical Testing (Jan. 25) ... 1019
Akron Holds Symposium on Softeners (Oct. 26) ... 305, 672
Bolt Named to Succeed Connell as Chairman at Southern Group ... 872
Boston Hears Loughborough and Bauman (Oct. 5) ... 307
Boston Holds X-mas Party (Dec. 14) ... 686
Connecticut Holds Fall Meeting (Nov. 16) 529
Connecticut Holds Outing (Sept. 8) ... 106
Detroit Hears Sweitzer (Feb. 1) ... 1062
Detroit Installs Officers (Dec. 7) ... 692
Elastomer and Plastics Group Hears Hulse (Jan. 15) ... 1053
Fort Wayne Group Meets (Feb. 7) ... 1054
Fort Wayne Hears Pike (Sept. 27) ... 326
Los Angeles Hears Lorenz (Feb. 5) ... 1062
New York Holds X-mas Party (Dec. 14) 692
New York Issues Membership Booklet... 523
New York Holds Symposium; Elects Officers (Oct. 5) ... 306
New York Holds Symposium on Latest Developments in Mechanical Rubber Goods 278
Ontario Hears Storey (Oct. 9) ... 300
Ontario Section Hears Sweitzer (Jan. 8) 859
Philadelphia Elects Officers; Hears Address by Gehman (Jan. 25) ... 863
Philadelphia Hears Allen; Holds Annual Fall Dance (Oct. 26) ... 518
Philadelphia Holds Outing (Aug. 17) ... 106
Philadelphia Offers Basic Technology Course ... 869
Quebec Holds Golf Outing (Sept. 28); Hears Address by Stewart (Oct. 18) ... 306
Southern Group Hears Lerner; Holds Two Symposiums (Nov. 16-17) ... 516
Southern Group Holds Two Symposiums (Feb. 8-9) ... 1038
Southern Rubber Group Formed ... 99
Thiokol Club Hears Sparks and Thomas (Sept. 25) ... 300
Various Groups Offering Courses in Rubber Technology ... 104
Washington Hears Garvey (Feb. 13)... 1056
Washington Hears Zapp (Jan. 16) ... 854
Rubber Industry Advisory Group Activities under Scrutiny by Congress ... 687
RUBBER MANUFACTURERS ASSOCIATION
Announces Floor Design Contest ... 870
Foresees Continuance of Good Business for 1957 ... 688
Holds 41st Annual Meeting (Nov. 28)... 508
New Type Descriptions to Improve Natural Quality ... 1041

S

SANDS, A. G. and MCDOWELL, M. V.
Electrical Stabilization of Conducting Neoprene Films ... 500
Seiberling Celebrates 35th Anniversary... 522
Seiberling and Lamb Agree on Joint Directors Slate ... 1037
Signal Corps Labs. Sponsor Wire and Cable Symposium ... 690
SILICONE RUBBER
Compounding Silicone Rubber for Minimum Shrinkage ... *J. J. Deasy and B. B. White* 1001
OTS Offers Research Reports on ... 92
Properties of Silicone Modified Rubber... *Ellis H. Phreaner* 255
SE-751 Oven Door Seal (G-E) ... 313
Silastic Brain Valve (Dow Corning) ... 506
Silastic LS-53 (Dow Corning) ... 314
Vinyl-Silicone Rubber Compounds (Union Carbide) ... 109
X-1516 Conductive Silicone ... 300
SMITH, SYDNEY, KITCHEN, LELAND J., LAVERY, THOMAS F. and GROVER, FRANK S.
Equipment for High-Temperature Testing 843
SOBIERAJSKI, C. A.
Latest Developments in Small Molded Goods ... 282
SOCIETY OF THE PLASTICS INDUSTRY
Holds 7th Annual Plastics Film and Sheeting Conference (Dec. 4-5) ... 696
Softeners for the Compounding of Rubber (Symposium Held by the Akron Rubber Group) ... 672
Coal Tar & Polymerized Products ... *P. O. Powers* 676
Ester Plasticizers ... *Maxwell A. Pollock* 676
Petroleum Products *Stewart S. Kurtz, Jr.* 673
Pine Products ... *L. O. Amberg* 674
Questions and Answers ... 678
SPRAGUE, GEORGE R.
Latest Developments in Expanded Rubber 281
STUDEBAKER, MERTON L.
Chemistry of Reinforcement I—Some Reactions between Carbon Black and Simple Inorganic Molecules ... 661
STUDEBAKER, MERTON L. and NABORS, LESTER G.
Chemistry of Reinforcement II—Scorch in Natural Rubber Stocks Containing Carbon Black ... 837
III—Model Systems Containing Carbon Black and Squalene ... 1027
STYRENE
Firestone Abandons Plans for Plant ... 106
Forth Chemicals Completes Expansion ... 318
Price Drop Reported ... 685
Super-Heated Steam Used as Diluent in Butadiene Manufacture ... 833
Synthetic Rubber Industry, Census Bureau Releases Report on ... 94
Synthetic Rubber—see Butadiene-Styrene, Butyl, Nitrile, etc.

T

TIRE CORD
Industrial Rayon Tyron Tire Cord on Exhibit ... 314
Super Rayon Tire Yarn (Avisco) ... 108
TIRES
Ameripol SN Tires Tested ... 308
Arctic Aircraft Tubeless (Goodyear) ... 695
Army Tests Coral Rubber Tires ... 103
Captive-Aire 14-inch (Goodyear) ... 328
DeLuxe Silvertown (Goodrich) ... 302
Folding Spare Tire (Gates Rubber) ... 322
Goodrich Vulcanizes Tire Through Nuclear Radiation ... 1038
Heavy Duty Trailer Tire (Dayton Rubber) 523
How the Army's Tire Technicians Save Rubber and Money ... 81
Light-Weight Truck Tire (Dayton Rubber) 1055
Plastic Coating Preservative (Army Chemical Corps) ... 98
Premium 14-inch Line (Seiberling) ... 315
Rib Hi-Miler Truck Tire (Goodyear)... 94
Subscription Service Tire Test (Three-T-Fleet) ... 320
Suburbanite 175 Bicycle Tire (Goodyear) 328
Super Fleetmaster Truck (U. S. Rubber) 112
Thorobred Mobile Home Low Boy (Dayton Rubber) ... 865
Town and Country (Firestone) ... 302
Trailer Tire-Rim-Wheel Unit (Goodyear) 98
U. S. Royal Safety 8 (U. S. Rubber)... 324
Use of Winter Tires Increases ... 302
Transparent Rubber, Compounding of. I—Natural Rubber ... 823
Transparent Rubber, Compounding of. II—Styrene-Butadiene, Nitrile, Butyl and Neoprene Rubbers ... 1007

U

U. S. RUBBER CO.
Acquires North British Rubber Co. ... 310
Building New Research Center ... 318
Denies Patent Infringement ... 1048
Developments:
CID Inflated Portable Warehouse ... 546
Sealdbin Industrial Container ... 717
Sponge Carpet Cushions ... 130
Super Fleetmaster Truck Tire ... 112
U. S. Royal Senior Golf Ball ... 859
Uscoweld Pipe Fittings ... 890
Expanding Belt Plant ... 865
Goodrich Suit Dismissed by Federal Court 686
Kaiser Aluminum Buys Wire and Cable Business ... 864
Opens New York Exhibit ... 521
Prepares for Hurricane Season ... 313
Reports on Current Stockholders ... 1038
URW Criticizes Closing of Plant at Washington, Ind. ... 864
Vils Elected Vice-President ... 1060

V

VINYL RESINS
Borden Opens Resin Plant ... 704
Diamond to Build Plant ... 1066
Duraseal Waterstops (Electrovert) ... 876
Insular Chemical Starts Vinyl Resin Production ... 299
Molded Vinyl Relief Globes Lend Themselves to Mass Production ... 270
New Plant Opens in Japan ... 533
Union Carbide Offers Plastisols Patent ... 704
Vinyl Gaskets (Goodyear) ... 322

W

WETHERBEE, BURT
How Engineered Cooling Paid Off for the Western Backing & Coating Co. ... 834
WHITE, B. B. and DEASY, J. J.
Compounding Silicone Rubber for Minimum Shrinkage ... 1001
WHITE, WILLIAM L.
Latest Developments in Rubber Belting ... 278
"Wicking" in Rubber Hose, Methods of Overcoming ... 277
Wire and Cable Symposium Sponsored by Signal Corps Laboratories ... 690
WOLF, RALPH F.
Compounding of Transparent Rubber. I—Natural Rubber ... 823
II—Styrene-Butadiene, Nitrile, Butyl and Neoprene Rubbers ... 1007

Index to Advertisers

Adamson United Co. —
Aetna-Standard Engineering Co. 52
Akron Presform Mold Co. —
Akron Rubber Machinery Co. 188
Albert, L., & Son 188
Alco Oil & Chemical Corp. —
Allied Chemical & Dye Corp. 47, 145
Allis-Chalmers Mfg. Co. 38-39
American Cyanamid Co.
Intermediate & Rubber Chemicals Dept. 167
Pigments Div. 55
American Synthetic Rubber Corp. 17
American Zinc Sales Co. —
Ames, B. C., Co. —
Argus Chemical Corp. 149
Askania Regulator Co. 46
Atlas Electric Devices Co. —

Baker, J. T., Chemical Co. —
Barrett Div. 145
Bedford-Bolling Co., Inc. 188
Bell Kaolin 171
Bestread Products Co. 185
Black Rock Manufacturing Co. 179
Bolling, Stewart, & Co., Inc. 11
Bonwitt, Eric 187
Borden Co., Chemical Div. 68
Brockton Cutting Die & Machine Co., Inc. 165
Brooklyn Color Works, Inc. —
Brown Co. —
Burgess Pigment Co. 16

Cabot, Godfrey L., Inc. 41
Cambridge Instrument Co., Inc. 165
Carey, Philip, Manufacturing Co. —
Carter Bell Manufacturing Co. 150
Cary Chemicals, Inc. 10
Celanese Corp. of America —
Chemical Publishing Co., Inc. 181
CLASSIFIED ADVERTISING 183-88
Cleveland Liner & Manufacturing Co. 54
Columbia-Southern Chemical Corp. —
Columbian Carbon Co. Insert Following 124
Columbian Carbon International, Inc. 26
Concord Mica Corp. —
Consolidated Products Co. 188
CONSULTANTS SECTION 186
Continental Carbon Co. —
Continental Machinery Co., Inc. —
Copolymer Rubber & Chemical Corp. Insert Following 160
Coulter, James, Machine Co. —
Cumberland Engineering Co., Inc. 159
Custom Engineering Co. 188
Cylinder Manufacturing Co., Inc. —

D. P. R. Inc. 173
Darlington Chemicals, Inc. 164
Day, J. H., Co. 8
Dayton Rubber Co. 179
Diamond Alkali Co., Pure Calcium Prod. Div. 32
Disco, Inc. 154
Dillon, W. C., & Co., Inc. 177
Dow Corning Corp. 34
Drake Personnel, Inc. 183
du Pont de Nemours, E. I. & Co., Inc.
Elastomers Div. Second Cover
Durez Plastics Div.,
Hooker Electrochemical Co. 40

Emerson Apparatus Co. —
Emery Industries, Inc. —
English Mica Co. 184
Enjay Co., Inc. 147
Erie Engine & Manufacturing Co. 156
Erie Foundry Co. —

Falls Engineering & Machine Co. 44-45
Farrel-Birmingham Co., Inc. 35
Ferro Corp. —
Ferry Machine Co. —
Fink, F. J., Co. —
Flexo Supply Co., Inc. 183
French Oil Mill Machinery Co. —

Gammeter, W. F. Co. 181
General Magnesite & Magnesia Co. —
General Porcelain Manufacturing Co. 173
General Tire & Rubber Co. 28-29
Genseke Brothers —
Gidley, Philip Tucker 186
Giffels & Vallet Inc. 42
Glidden Co.
Chemicals-Pigments-Metals Div. 21
Goodman, G. F., & Son —
Goodrich, B. F. Chemical Co. 3
Goodrich-Gulf Chemicals, Inc. 58
Goodyear Tire & Rubber Co.
Chemical Div. Insert Following 18, 5, 25, 63
Gummi und Asbest 179

Hale & Kullgren, Inc. 52, 186
Hall, C. P. Co. 141, 160
Harshaw Chemical Co. —
Harwick Standard Chemical Co. Back Cover
Hercules Powder Co., Inc. —
Hoggson & Pettis Manufacturing Co. 60
Holliston Mills, Inc. 151
Holmes, Stanley H., Co. 157
Hooker Electrochemical 40
Howe Machinery Co., Inc. 186
Huber, J. M. Corp. 6

Independent Die & Supply Co. 177
Industrial Div., Pennsylvania Salt Mfg. Co. Insert Following 59
Industrial Ovens, Inc. —
Institution of the Rubber Industry —

Johnson Corp. —
Johnson Machinery Co. 187
Johnson Steel & Wire Co., Inc. 72-73
Justrite Mfg. Co. 164

Kautschuk und Gummi —
K. B. C. Industries, Inc. 185
Kellogg, M. W., Co. —
Kingsbacher-Murphy Co. —
Korbet Corp. —

La Goma —
Lambert, E. P., Co. —
Lehmann, J. M., Co., Inc. —
Litzler, C. A., Inc. 175

Marbon Chemical Div. 13
Marine Magnesium Div. 155
Maryland Cork Co., Inc. —
Mast Development Co. 158
McNeil Machine & Engineering Co. 187
Merck & Co., Inc. 155
Monsanto Chemical Co.
Rubber Chemicals Dept. 51
Mount Vernon Mills, Inc. 56-57
Muehlstein, H., & Co., Inc. 139
Mumper, J. F., Co. 186

National Aniline Div. 47
National Chemical & Plastics Co. —
National Rosin Oil Products, Inc. 184
National Rubber Machinery Co. 15
National Standard Co. —
Naugatuck Chemical Division
U.S. Rubber Co. 9, 74
Nelson Employment Service 183
Neville Chemical Co. 69
New England Engineering Co., Inc. —
New Jersey Zinc Co. —

Olin Mathieson Chemical Corp. 14
Olin, R. R., Laboratories 186
Osborn Manufacturing Co. 12

Parsons-Plymouth, M. W., Inc. —
Paterson Parchment Paper Co. —
Pelmor Laboratories Inc. 186
Pennsylvania Industrial Chemical Corp. 71
Pequanoc Rubber Co. 185
Petro-Tex Chemical Corp. 37
Phillips Chemical Co.
Philblack 4
Philchem 33
Pittsburgh Steel Co. 72-73
Polychemicals Division, West Virginia Pulp and Paper Company —
Polymer Corp. 53
Polymer Corp., Ltd. —
Progressive Service Co. 151
Pure Carbonic Co. 181

Rand Rubber Co. —
Randall, Frank E., Co., Inc. —
Rare Metal Products Co. 184
Reliable Rubber & Plastic Machinery Co. 187
Resin Research Labs., Inc. 186
Revue Générale du Caoutchouc —
Richardson, Sid, Carbon Co. 194
Royle, John, & Sons 173
Rubber Corp. of America 175
Rubber Age Books 60, 62, 70, 162
Rubber Journal 177
Rubber Red Book 64

St. Joseph Lead Co. —
Sargent's, C. G., Sons Corp. 148
Schuman, A., Inc. Third Cover
Scott Testers, Inc. 184
Shaw, Francis & Co., Ltd. 20
Shell Chemical Corp. 22
Shell Oil Co. Insert Following 142
Sherman Rubber Machinery Co. Div. 187
Shiraishi Kogyo Kaisha, Ltd. 186
Shore Instrument Co. —
Siempelkamp, G., & Co. —
Skinner Engine Co. —
Snell, Foster D., Inc. 186
South Florida Test Service 186
South Texas Tire Test Fleet, Inc. 160
Southeastern Clay Co. 179
Southern Clays, Inc. —
Spadone Machine Co. 163
Stamford Rubber Supply Co. 171
Herman H. Sticht Co., Inc. —
Stoner's Ink Co. 184
Sun Oil Co. 67

Tapper, William 188
Taylor Instrument Companies 36
Taylor-Stiles & Co. —
Testing Machines Inc. 152
Texas-U.S. Chemical Co. 65
Thiokol Chemical Corp. —
Thomaston Mills 175
Thropp, William R., & Sons, Div. J. M. Lehmann Co. —
Titanium Pigment Corp. 66
Tracerlab Inc. —
Trade News Service —
Turner Halsey Co. 56-57

Union Carbide & Carbon Corp. 31
United Carbon Co., Inc. Insert Following 48
United Clay Mines Corp. 18
United Engineering & Foundry Co. —
United Rubber Machinery Exchange —
U. S. Rubber Co.
Naugatuck Chemical Div. 9, 74
U. S. Rubber Reclaiming Co., Inc. 30
Universal Hydraulic Machinery Co. 188
Universal Oil Products Co. 61
Utility Manufacturing Co. 181

Vanderbilt, R. T., Co. Front Cover, 181
Velsicol Chemical Corp. —

Wellington Sears Co. 48
West Virginia Pulp and Paper Co. —
Western Supplies Co. 171
White, J. J. Products Co. —
Whittaker, Clark & Daniels, Inc. 151, 171
Williams, C. K., & Co., Inc. 153
Witco Chemical Co. 43
Woloch, George, Co., Inc. —
Wood, R. D., Co. 27

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In This Issue

How to Obtain a Patent .....page 279

♦

Compounding Rubber to Resist Hydraulic Fluids .....page 265

♦

Contents .....page 203

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